AIRWAY POSTER DISPLAY
Saturday, June 20
12:00 PM - 1:00 PM

80770 - HEMODYNAMIC PROFILE OF BIS GUIDED NON PARALITIC TRACHEAL INTUBATION
Presenting Author: Luiz Antonio Mondador, Cancer Center A.C. Camargo, Sao Paulo, Not applicable, Brazil
Co-Authors(s): Marcelo S. Ramos

82224 - ISOLATION OF LUNG WITH DOUBLE LUMEN TUBE IN A CASE OF DIFFICULT AIRWAY
Presenting Author: Luiz Antonio Mondador, Cancer Center A.C. Camargo, Sao Paulo, Not applicable, Brazil
Co-Authors(s): Marcelo S. Ramos

85891 - ANESTHETIC MANAGEMENT OF INCIDENTAL VALLECCULAR CYSTS
Primary Author / Presenting Author: Leon Vorobeichik, Department of Anesthesia, University of Toronto, Toronto, Ontario
Co-Authors(s): Gregory Hare, Pamela McLachlan, Molly Zirkle, Marco Garavaglia

85943 - RESCUE OF A FAILED ETT PILOT BALLOON IN A DIFFICULT AIRWAY: CASE REPORT
Primary Author / Presenting Author: Kelly Au, University of Ottawa, Ottawa, Ontario
Co-Authors(s): Naveen Eipe

86044 - DIFFICULT NASAL INTUBATION DUE TO A PROMINENT ANTERIOR TUBERCLE OF C1
Primary Author / Presenting Author: David E. Watton, Dalhousie University, Halifax, Nova Scotia
Co-Authors(s): Orlando Hung, Ben Cairns
80770 - HEMODYNAMIC PROFILE OF BIS GUIDED NON PARALITIC TRACHEAL INTUBATION

Author(s)
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Introduction: Studies have shown that remifentanil in combination with propofol provides adequate conditions for laryngoscopy and tracheal intubation (TI) without muscle relaxants. We evaluated the hemodynamic response to a BIS guided, non paralytic technique with two doses of the opiate.

Methods: Local Research Ethics Board (REB) approved the study. We reviewed charts of 2 groups of patients: patients anesthetized with 1,2 mcg/Kg remifentanil+ lidocaine 1,5 mg/Kg + propofol enough to produce BIS between 40 and 55; and patients with the same induction but 2 mcg/Kg remifentanil. TI conditions and hemodynamic data were recorded.

Results: Among 23 cases in 1,2 mcg/Kg group, and 24 patients who received 2 mcg/Kg remifentanil, BIS 40-55 predicted acceptable TI conditions 18 patients (78,2%) and in 21 (87,5%) respectively. Incidence of drops in hemodynamic variables is depicted in Table1.
With both doses: In no case the drop reached 50% of baseline values, the attending anesthesiologist never deemed necessary resort to muscle relaxation to perform the TI, and there were no hemodynamic difference between the patients with acceptable and non acceptable TI conditions. TI conditions were related to Cormack grade.

Conclusion: Increasing the dose of remifentanil from 1,2 to 2 mcg/Kg increases the reliability of BIS (up to 87,5%) as a predictor for acceptable IOT conditions without relaxants, but also increases the incidence of drops, especially systolic pressure, beyond 25% of the baseline. We speculate if it would be useful to add some vasopressor preemptively to this technique, for the sake of stability. NO disclosures. No financial support.

References:
Isolation of lung with double lumen tube (DLT) is sometimes (even with endoscopic help) a demanding task, especially in a case of difficult airway. The combination of the both features in the same patient makes this case rare and challenging.

**Case Report:** Male 66 year old. Comorbidities: type 2 diabetes, dyslipidemia, carotid atheromatosis, obesity (BMI 35.9 Kg/m2) and hypertension. Previous anesthesias 1 - (for colon cancer March 2013): failure of intubation (with McCoy laryngoscope and Fastrach ILMA), he was awakened and fiberoptic intubation was done with difficulty. 2 - (hepatectomy, August 2013), awake fiberoptic intubation with great difficulty due to the relative size of his tongue to his mouth. Now he was scheduled for lung lobectomy for metastasis.

He has borderline thyromental distance, despite good mouth opening he was graded Mallampati IV. He is cooperative and understood the risk related to his airway management. We employed up to 3.57 mg/Kg of lidocaine for airway anesthesia (90 mg in non-needle block with 10% spray +160 mg trans endoscopic), and sedation with 1.2 mcg/Kg remifentanil (injected in 2 minutes) + 0.08 mcg/Kg/min. Oxygen 7 L/min via nasal prong. Insertion of a Valentin Madrid (VAMA) canula (that allowed our vison of the larynx), proved the adequacy of glossopharyngeal block. We believe that we could not see the larynx without the VAMA canula.

It was difficult to maneuver the endoscope passed through the bronchial lumen of a DLT especially because the VAMA canula had to be replaced for a bite block (after getting larynx view) due to the bulk of the DLT. In the first attempt, with the carina in view, we were not able to rail a (39 left) DLT into the trachea, despite several rotations. We repeated the procedure with a smaller tube (37 left) and after several 90 degree rotations we succeed to thread the DLT into the trachea. At this point we navigate the tip of the endoscope to the left main bronchi and could identify its ramification. Then we railroaded bronchial tip of the DLT into the left main bronchi.

Patient remained conscious and complied to the repeatedly anesthesiologist's command to breath, his saturation was never below 97%. Despite full memory of the procedure the patient did not grade it as a particular bad experience. After surgery DLT removal was done over an exchange catheter in the trachea.

**Discussion:** We followed ASA guideline for difficult airway [1] and tried to do the best
for lung isolation[2], as described in literature[3]. Our alternate plan was to intubate with single lumen tube and try to use a tube changer as a rail to the bronchial lumen of the DLT, and then endoscopically locate the DLT. Other alternative would be to use a bronchial blocker via a single lumen tube.

References:

[1] Anesthesiology, 2013 V 118 • No 2
**Introduction:** Vallecular cysts are largely asymptomatic in adults and typically described upon incidental discovery during laryngoscopy, where they may present a challenge in airway management. Existing literature is currently limited to case reports despite potential for life-threatening complications.

**Methods:** We describe management of such a case (patient consent and REB approval obtained). A literature review is then followed by anesthetic management recommendations, in relation to Canadian Airway Focus Group (CAFG) guidelines.

**Results:** A vallecular cyst was incidentally discovered in a healthy 64-year-old on induction for an elective laparoscopy. Unexpected difficult bag-mask ventilation was followed by three laryngoscopies (Macintosh 3 and Glidescope with grade 2b and 3 views, respectively) and one successful attempt of intubation. Intraoperative ENT consultation was requested and suspension laryngoscopy was performed with difficulty (fig 1A). Cyst incision under direct laryngoscopy combined with a fibreoptic bronchoscope yielded cyst rupture and airway edema (fig. 1B) necessitating ICU admission and delayed extubation on post-operative day 2.

Review of relevant reports (n=17) revealed that while 59% of attempts at ventilation were easy, 35% were difficult (as defined by CAFG) and in one, impossible. Description of supraglottic airway device (SGD) use with vallecular cysts is limited to two cases of SGD failure and one of successful rescue use. Review of laryngoscopy demonstrated an average of 2.8 laryngoscopy attempts per case; intubation under direct laryngoscopy was successful in 65% when attempted, and a further 18% with ENT assistance. Video laryngoscopy failure rate was 100% while fibreoptic bronchoscopy was 100% successful. One case necessitated a tracheostomy. Intraoperative ENT consultation was sought in 53% of cases (two on induction, six post-intubation); ENT cyst treatment rate was 100%. Postoperative extubation was uneventful in 86% of cases, two ICU admissions were noted.

**Discussion:** Ventilation: CAFG recommend SGD in persistent difficult mask ventilation. However, vallecular cysts may distort supraglottic anatomy. Thus, incidental vallecular
cysts may represent a limitation in the applicability of difficult airway algorithms in events of difficult ventilation.

**Endotracheal Intubation:** Vallecular cysts may pose a challenge to laryngoscopy and endotracheal intubation. CAFG recommends alternative approaches in the event of difficult laryngoscopy. However, our review suggested failure of video laryngoscopy and ILMA, while highlighting the success of fibreoptic intubation, potentially representing another limitation of existing guidelines in reference to vallecular cysts.

**ENT Consultation:** Immediate ENT consultation is recommended where appropriate, e.g. difficulty maintaining oxygenation and multiple failed attempts at laryngoscopy or intubation. Furthermore, intraoperative consultation for cyst treatment should be sought for all cases, allowing for a secured airway and monitored recovery.

**Exubration:** Evaluation of the airway under direct visualization and/or a leak test prior to extubation may be considered to rule out airway edema, bleeding, or cyst rupture.

**References:**

85943 - RESCUE OF A FAILED ETT PILOT BALLOON IN A DIFFICULT AIRWAY: CASE REPORT

Author(s)
Kelly Au
University of Ottawa
Primary Author / Presenting Author

Co-Authors(s)
Naveen Eipe - The Ottawa Hospital

Introduction:
Within the general surgical population, the incidence of anticipated difficult airways increases approximately 10-fold in the laboring parturient. Though the exact incidence is likely unknown, the management of these difficult airways is further complicated in obese parturients with pre-eclampsia. While regional anesthesia is still preferred, urgent delivery may require a general anesthetic, tracheal intubation and controlled ventilation. We report an unusual failure of airway equipment that required immediate management.

The patient has provided written consent for the reporting and publication of this case report which includes appropriately masked photographs.

Case description:
Labor was being induced in a 37 year-old at 33+1 weeks gestational age for severe preeclampsia. Shortly thereafter, an emergency cesarean section was called for due to intermittent fetal bradycardia. The patient had features suggestive of a difficult airway: morbid obesity with a BMI of 44kg/m², generalized edema, short stature, Airway Class 4 and a thick neck. Initially a spinal anesthetic was attempted, but was unsuccessful. Worsening fetal decompensation developed and the decision to proceed with a general anesthetic was made. The anesthetic was induced with a rapid sequence technique. A Grade 2 laryngoscopy view was obtained and a pre-packaged endotracheal tube with stylet was successfully inserted into the trachea. Once tracheal position was confirmed, the surgeons were instructed to proceed. When the attempt to inflate the cuff was made, it was discovered that the pilot balloon had been severed from the inflation tubing. Pharyngeal packing was inserted to tamponade the airway leak and the surgery and anesthetic continued without complication.

Discussion:
We review this case and discuss the causes of the damage of the tracheal tube inflation cuff. Firstly, there may have been a manufacturing defect in the initial production of the ETT or during the secondary preparation process in which a stylet was inserted and both were sterilized and repackaged. Standard inspection of the ETT prior to insertion may have overlooked this damage or the inspection neglected entirely in the urgency of the situation. As well, accidental trauma could have severed the inflation tubing, which
has commonly been described during ETT manipulation [1,2,3,4]. Though we were able to proceed without replacing the endotracheal tube, various options for this scenario include (1) repairing the pilot balloon, (2) tamponading the airway and/or (3) exchanging the endotracheal tube. For each option, there are a variety of possibilities. Also, if one method fails, another could be attempted if clinically appropriate. Previously published algorithms address this decision-making process, but neglect to incorporate the variables of an urgent situation with a difficult airway as we experienced in this case [1]. Therefore, we have developed an alternative algorithm for management of an airway leak (Figure 1).

References:

Introduction: This is a case report of an unanticipated difficult nasal intubation due to a prominent anterior tubercle of C1 resulting an aspiration of blood and hypoxemia following intubation.

Methods: The information for this case report was obtained from the electronic health record as well as interviewing the parties involved.

Results: A healthy 17 year old female received a general anesthetic for an elective Lefort with bilateral sagittal split osteotomy requiring a nasotracheal intubation. After an unremarkable induction of general anesthesia, an attempt was made to insert a nasotracheal tube (NTT). Several attempts to insert the NTT through both nostrils were unsuccessful and blood was observed in the pharynx. Nasotracheal intubation was eventually successful after several attempts.

Unfortunately, there was a decrease in air entry on the right chest and a decrease in oxygen saturation (low 90s) An intraoperative chest x-Ray showed right upper lobe atelectasis consistent with aspiration of blood. The operation was cancelled and the patient was awoken without difficulty and admitted to the hospital for observation. A review of the lateral x-ray of the head and neck of the patient showed a prominent anterior tubercle on C1. She returned for her operation 3 months later. To facilitate the advancement of the NTT over the prominent anterior tubercle on C1 under general anesthesia, the anesthesiologist placed the left index finger in the nasopharynx and lifted the tip of the NTT over the prominent anterior tubercle. The NTT was then advanced into the tracheal under indirect vision using a CMAC (Storz) without any difficulties or trauma. The surgical procedure was completed without any difficulties.

Discussion: Difficulty in advancing a NTT into nasopharynx during nasal intubation may be associated with a prominent anterior tubercle of C1. A number of methods may be used to circumvent this obstacle. These include: (1) The left index finger of the practitioner can reach into the nasopharynx in order to palpate the tip of the nNTT which can then be lifted anteriorly by finger or pushed to one side and gently advanced past the prominence; (2) Insertion of a pediatric tube exchanger or a cut nasogastric tube.
through a nasal airway. This smaller caliber catheter may help to get around the prominent tubercle of C1 so that the NTT can then be easily advanced over the prominent anterior tubercle of C1; and (3) The use of the Endotrol tracheal tube which can provide directional control of the tube tip with the plastic ring on the Endotrol tube.
**AMBULATORY POSTER DISPLAY**
Sunday, June 21
11:30 AM - 12:30 PM

83770 - AMBULATORY SURGERY DAY OF THE WEEK DOES NOT IMPACT READMISSION OR ED USE
Primary Author / Presenting Author: Daniel I. McIsaac, University of Ottawa, The Ottawa Hospital, Ottawa Hospital Research Institute, Institute for Clinical Evaluative Sciences, Ottawa, Ontario
Co-Authors(s): Gregory Bryson, Carl van Walraven

86139 - A MULTI-FACETED PERIOPERATIVE TOBACCO INTERVENTION VS. BRIEF ADVICE
Primary Author / Presenting Author: Jean Wong, University Health Network, University of Toronto, Toronto, Ontario
Co-Authors(s): Amir Abrishami, Xin Chen, Sheila Riazi Riazi, Naveed Siddiqui, David T. Wong T. Wong, Eric You-Ten, Peter Selby, Frances Chung
Introduction: Surgery is increasingly performed on an ambulatory basis, and has proven to be relatively safe. However, over 3% of patients may require unplanned acute postoperative medical care. The day of the week of surgery has been shown to impact postoperative mortality following inpatient surgery; the impact after ambulatory surgery is unknown. We hypothesized that ambulatory surgery performed later in the work week may impact access to continuous care, and shift the burden of care to emergency departments (ED) or hospitals.

Methods: Following approval by the ethical review board, we conducted a historical cohort analysis of population-based health administrative data in Ontario, Canada. Individuals were selected if they underwent planned ambulatory knee or shoulder surgery, hernia repair, lumpectomy, transurethral resection, or laparoscopic cholecystectomy between 2002 and 2012. Multivariable regression was used to measure the association between day of the week of surgery and our primary outcome, a composite of ED visit or readmission within 30 days of successful discharge on the day of surgery; and unsuccessful discharge on the day of surgery, our secondary outcome. We also determined which day of the week ambulatory surgery patients were most likely to return to the ED, regardless of the day of surgery.

Results: Of 296 497 patients, 9 197 (3.1%) were not discharged on the day of surgery. 32 100 (10.5%) discharged patients returned to the ED or were readmitted within 30 days. Adjusting for socio-demographic factors, comorbidities, and preoperative health resource use, Friday surgery was significantly associated with ED visit or readmission (adjusted HR 1.07, 95%CI 1.03-1.11) compared to Monday. This association was notably stronger after transurethral and shoulder surgery. No association between day of the week and unsuccessful discharge was noted. Regardless of day of surgery, patients were most likely to visit the ED on Saturday or Sunday after ambulatory surgery.

Conclusion: On a population-level, day of the week of ambulatory surgery is not strongly associated with ED visits or readmission. Certain surgical types may be more susceptible to a day of the week effect, but more research is needed. With over 10% of successfully discharged ambulatory surgery patients requiring acute medical attention within 30 days, and higher rates of ED visits over the weekend, we suggest future
efforts to address issues of continuity and transitions in care to improve patient safety and experience.

References:
Med Care 2014 52: 557-564
BMJ 2013 346: f2424
CMAJ 2002 166:1672-1673
86139 - A MULTI-FACETED PERIOPERATIVE TOBACCO INTERVENTION VS. BRIEF ADVICE

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Peter Selby - Dalla Lana School of Public Health, University of
Frances Chung - Toronto Western Hospital

Introduction: Intensive perioperative smoking cessation interventions increase abstinence\(^1\,^2\) and reduce complications.\(^3\) However, the American Society of Anesthesiologists and the Canadian Anesthesiologists' Society suggest brief advice and referral to Smokers' Helpline. The efficacy of this approach on abstinence is unclear. The objective of this study was to determine the efficacy of a multi-faceted intervention vs. brief advice and self-referral to Smokers' Helpline on abstinence in patients undergoing elective surgery.

Methods: Approval was obtained from the REB of two participating institutions and informed consent was obtained from all participants for this multi-centred, randomized controlled trial. A total of 296 patients were randomized to receive either: 1) multi-faceted intervention (a standardized 10-15 min counseling session by anesthesiologists trained to provide smoking cessation interventions, varenicline for 3 months, and a fax referral to Smokers’ Helpline); or 2) standardized brief advice (< 5 min) by anesthesiologists trained to provide smoking cessation interventions and provision of the Smokers’ Helpline number for self-referral. The primary outcome was biochemically (urine cotinine) confirmed 7-day point prevalence abstinence at 12 months. Secondary outcomes included: 7-day point prevalence abstinence at 1, 3, 6 months. An intention-to-treat analysis was performed. Chi-square test or Fisher’s exact test (for categorical variables) and unpaired Student \(t\) tests (for continuous variables) were used. Multivariable logistic regression was performed to identify independent variables related to abstinence. \(P < 0.05\) was considered statistically significant.

Results: Demographic variables were similar between the two groups, except the nicotine dependence was higher in the multi-faceted intervention group vs. the brief advice group (Fagerstrom test-score 4.99±2 vs. 4.37±2, \(p < 0.01\)). The 7-day point prevalence abstinence at 12 months for the multi-faceted intervention vs. brief advice was 46.6% vs. 29.2% (\(p < 0.01\)). At 1, 3, and 6 months, the 7-day point prevalence...
abstinence was 51.1% vs. 24.8% (p < 0.01), 53.3% vs. 28.2% (p < 0.01), 50.8% vs. 29% (p < 0.01), respectively (Figure). The rate of quitline contact was 78.8% vs. 8.3% (p < 0.01) in the multi-faceted intervention group vs. the brief advice group. The multi-faceted intervention was associated with higher abstinence at 1, 6, 12 months (OR 2.0; 95% CI 1.02-3.92, p < 0.05, OR 1.9; 95% CI 1.12-3.20, p=0.02, OR 2.1; 95% CI 1.22-3.54, p < 0.01), respectively. Smokers' Helpline utilization was associated with abstinence in both groups at 1, 3, 6 months (OR 2.1; 95% CI 1.06-4.26, p=0.03, OR 4.8; 95% CI 2.23-10.22, p < 0.01, OR 7.7; 95% CI 1.66-35.31, p < 0.01), respectively.

**Conclusion:** Our study confirms that multi-faceted perioperative smoking cessation interventions more effectively increase both long-term and short-term abstinence compared to brief advice. Nonetheless, the quit rate in the brief advice group was still higher (29.2%) than the spontaneous unassisted quit rate of 4-7% in the general population.4

**References:**


CRITICAL CARE POSTER DISPLAY
Sunday, June 21
11:30 AM - 12:30 PM

82906 - IMPROVING AD HOC TEAM PERFORMANCE WITH A UNIQUE COMMUNICATION TOOL
Primary Author / Presenting Author: Irene D. McGhee, Sunnybrook Health Sciences Centre, Flesherton, Ontario
Co-Authors(s): Jordan Tarshis, Susan DeSousa, Raluca Tiganila

84274 - A SYSTEMATIC REVIEW OF CASE REPORTS OF FACTOR XIII INHIBITOR
Primary Author / Presenting Author: Kira J. Tone, Ottawa University, Ottawa, Ontario
Co-Authors(s): Tyler James, Dean Ferguson, Jason Tay, Marc Avey, Shaun Kilty, Alan Tinmouth, Manoj Lalu

85348 - POSTOPERATIVE SEROTONIN SYNDROME IN A PATIENT WITH HISTORY OF MH
Presenting Author: Nayer Youssef, Toronto General Hospital, Milton, Ontario
Primary Author: Adriaan Van Rensburg, University of Toronto, Department of Anesthesia and Pain Management, Toronto, Ontario
Co-Authors(s): Natalie Silverton, Karen Foley, Sheila Riazi

85952 - SOFA VS INDIVIDUAL ORGAN DYSFUNCTION AS A PREDICTOR IN ICU
Primary Author / Presenting Author: Aditi Jain, Government Medical College and Hospital, Sector 32, Chandigarh, India, Chandigarh, Not applicable, India
Co-Authors(s): Sanjeev Palta
Introduction: Anesthesiology residents are key members of various emergency teams outside the operating room. Such scenarios can be challenging and stressful for many reasons; lack of familiar supports (e.g. personnel and resource availability), leadership is unclear, patient condition is critical and not well defined, and the medical team gathered, “for this specific purpose” (i.e. AD HOC), are unknown to each other – it is unlikely that they have worked together before and they will probably not work together again.¹

A standardized communication framework called “I START-END” (described in the attachment) was created to assist anesthesia residents to perform more effectively on AD HOC teams.

The I START-END communication tool is based on Crisis Resource Management principles² and operationalizes the key concepts of leadership, closed loop communication, shared mental models, situational awareness and adaptive behavior.³ The tool guides a “process” and is not content specific. It sets the expectation that teams need to talk and encourages this dialog by standardizing the interaction and getting everyone “on the same page”.

Methods: A pilot study was designed and approved by the local Research Ethics Board. 17 anesthesia residents participated in this study from July to October 2014.

Residents filled out a PRE-tool questionnaire about their experience in AD HOC settings.

Each resident, served as their own control, and participated in two simulated AD HOC scenarios; one PRE-tool training and one POST-tool training.

The I START-END tool was taught in a small group session at the end of the PRE-tool simulator session and a memory aid provided.

A POST-tool training questionnaire was administered.
**Results:** PRE questionnaires: 85% of residents stated the AD HOC setting “feels” chaotic & out of control, that working with people they don’t know is challenging, and that it is difficult “to be heard” in this setting.

POST questionnaires: 90% of residents stated the I START-END tool was OFTEN or ALWAYS helpful in the AD HOC setting. It facilitated communication and speaking up, and made them more aware of what else was happening with the patient and to anticipate additional resources needed.

**Discussion:** I START-END encourages a communication PROCESS that actualizes the principles of Crisis Resource Management.

Training individual residents in I START-END improved their subjective ability to effectively perform on AD HOC teams.

The I START-END intervention moves a team from performing not ONLY as a group of **competent individuals** but also as a **collectively competent team**.4

I START-END is a process not bound by content so it may be transferrable to other teams and healthcare settings.

As the complexity of medicine increases, it is the norm that a single patient will require the expertise of many healthcare workers who have no prior/future relationship with each other (AD HOC encounter).5

To prevent fragmentation of care, resilient communication strategies, such as I START END, are essential for successful inter-professional practice of the future.6

**References:**


5. Medical Education. 2011;45(12):1171-3.

Introduction: Factor XIII (FXIII) cross-links fibrin monomers to support clot stabilization and wound healing. Acquired FXIII deficiency is caused by autoantibodies that inhibit FXIII, and can result in bleeding despite normal routine coagulation tests. Given the rarity of this disease, large clinical studies to inform clinical practice are not feasible. We therefore performed a systematic review of case reports and case series of acquired FXIII inhibitor to answer the question “In hospitalized or perioperative patients what are the management and treatment strategies for acquired FXIII inhibitor?”

Methods: Ethics was not required, this is a review of published literature. A systematic search of MEDLINE, Embase, and Web of Science (to 07/2014) identified all reports of hospitalized/perioperative patients with acquired FXII deficiency. No restrictions were placed on language or publication type. Article screening and data extraction were performed independently by two reviewers. Completeness of reporting was evaluated according to elements from the CARE guidelines. PROSPERO registration: 42014006279

Results: 1082 citations were reviewed with 36 case reports and 3 case series meeting eligibility criteria (66 patients total). There were 18 patients in the perioperative setting and 48 in the hospitalized setting. The mean age was 61 [range 9-87] with equal gender representation. At presentation, 51 patients (77%) had intramuscular or subcutaneous bleeding, and 38 patients (58%) had external or surgical bleeding. Identified risk factors for FXIII acquired inhibitor included autoimmune disease in 12 patients (18%) and isoniazid treatment in 6 patients (9%). All cases were diagnosed by a two-step process, identification of the FXIII deficiency followed by identification of the inhibitor. Specific inhibitor type was reported for 26 patients (39%), with 20 of those patients having an IgG auto-antibody. Clinical improvement in bleeding was seen in patients receiving FXIII concentrate (11/17 patients), cryoprecipitate (4/8), plasma (2/6). Inhibitor reduction was seen in patients who received rituximab (5/5 patients), plasma exchange (1/1), exchange transfusion (1/1), IVIG (1/1), steroid (10/14), cyclophosphamide (8/12). Concurrent initiation of multiple therapies made direct independent association to
outcomes difficult to establish. Outcomes were reported for 56 patients (85%) with 41 patients (73%) having complete inhibitor eradication and 15 patients (27%) having partial resolution; 22 patients (39%) had a relapse and 14 patients (25%) died (7 from internal hemorrhage). Completeness of reporting varied for specific CARE items. Patient demographics, clinician assessed outcome and laboratory tests were reported in all case reports. Least reported items included informed consent and a title containing the words 'case report'.

**Discussion:** This systematic review provides the most complete overview of FXIII acquired inhibitor to date. There is a paucity of data available on FXIII acquired inhibitor. Available data may be limited by variable reporting. Despite multimodal therapy, a significant proportion of patients with FXIII acquired inhibitor have a large burden of morbidity and mortality.
85348 - POSTOPERATIVE SEROTONIN SYNDROME IN A PATIENT WITH HISTORY OF MH

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Sheila Riazi - University of Toronto

Introduction: Serotonin Syndrome is a rare reaction caused by excessive activation of both central and peripheral serotonin receptors. This can occur with therapeutic drug usage, over dosage, or by the interaction between serotoninergic drugs. There are case reports of patients developing serotonin syndrome in the peri-operative settings, but this one is unique in its presentation in a patient with a history of MH. Written informed consent was obtained for publication.

Case Report: A 55 year-old male with hypertrophic cardiomyopathy presented for septal myectomy. His past history is significant for an MH reaction that was later confirmed on muscle biopsy, and depression for which he was on Paroxetine. Following a non-triggering anesthetic induction, the patient developed mild hyperthermia that was accompanied by increased ETCO2. This was followed by significant tachycardia, hypertension and diaphoresis during central cannulation. Those manifestations were corrected with the initiation of cardiopulmonary bypass. The rest of the surgery was completed uneventfully. In ICU, patient was hypotensive and increasingly febrile despite active cooling. Later on he developed metabolic acidosis for which cardiac etiology was ruled out and Propofol sedation was switched to Fentanyl infusion. On exam, there was muscle stiffness and inducible clonus. This was associated with significantly elevated CK levels. A diagnosis of Serotonin Syndrome was made and treatment with Cyproheptadine was initiated. Sedating agents were discontinued and patient was later extubated, becoming fully alert and oriented after 5 days of supportive care. Cyproheptadine was continued for 4 days and stopped on developing signs of anticholinergic syndrome. His fever continued for 6 days and was discharged from the ICU on day 7.

Discussion: Peri-operative Serotonin syndrome usually results from the interaction between SSRIs or MAO-I and the peri-operative administration of serotonergic agents. Our patient was on paroxetine and was given fentanyl, remifentanil, and Ondansetron intra-operatively. He was also started on fentanyl infusion post-
Clinical symptoms of serotonin syndrome range from clonus, tremors and diarrhea in mild cases to delirium, hyperpyrexia and muscular rigidity in life-threatening cases. It can also be complicated by metabolic acidosis, elevated liver enzymes and renal failure\(^1\). The development of hyper metabolic manifestations made the diagnosis of serotonin syndrome difficult. With history of MH, our patient developed fever and hypercarbia following a trigger free anesthetic. There are rare case reports of patients developing MH without exposure to classic triggering agents\(^4\). However, our patient had only mild metabolic acidosis not the severe forms that would be expected with MH. The other distinguishing feature was the development of clonus, which is key in serotonin syndrome. Other metabolic syndromes that were on the differential diagnosis were neuroleptic malignant syndrome, which can occur with long-term use of dopamine antagonists or abrupt withdrawal of dopamine agonists\(^5\). Also, Propofol infusion syndrome, that is generally associated with higher doses and prolonged Propofol infusions and is extremely rare\(^6\).

**References:**

6. Anaesthesia 2007; 62: 690-701
SOFA VS INDIVIDUAL ORGAN DYSFUNCTION AS A PREDICTOR IN ICU

Introduction: The Sequential Organ Failure Assessment (SOFA) is a well established tool to predict mortality in critically ill patients. However, the importance of its individual components is not known. The present study was done to determine the same.

Methods: After approval from institute ethics committee, in a prospective study, 41 consecutive patients admitted to ICU over an 8 week period were studied. Based on clinical examination and relevant laboratory investigations, SOFA scores were calculated 24 hours post admission and subsequently every 48 hours for the first 10 days. Patients were followed till discharge/death/transfer from ICU. The outcome measures studied were mortality and duration of stay in ICU. SOFA scores and individual organ dysfunction scores were correlated with the outcome measures using Mann Whitney test. Multivariate analysis of factors predicting the mortality was done with regression analysis (SPSS package).

Results: Of the 41 subjects 25 were males & 16 were females (age range 15-80 years; mean age 40 ± 16 years). Sixteen subjects (39%) died. Indications of admission to ICU were due to 30 (73%) surgical, 10 (24%) medical and 1 (3%) obstetrical reasons. Total SOFA scores of day 1, 3 and 5 correlated significantly with survival but those of day 7 and 9 did not. Poor cardiovascular score on day 1 and day 3, coagulation profile on day 3 and respiratory score on day 7 correlated significantly with mortality. The rest of the individual system scores did not predict survival. The mean SOFA score and maximum SOFA score for each subject correlated significantly with mortality and survival. The duration of stay in ICU did not have a significant correlation with the outcome.

Discussion: Evaluation of the SOFA score can prove to be a useful protocol in ICU setting. The total SOFA score represents the cumulative organ dysfunction of the patient. This study shows that though the different system scores form an important component of SOFA calculation yet individually they may not be good predictors. Mean and maximum SOFA score help determine the severity of illness and can act as a guide for the intensity of therapy required for each patient. Hence SOFA should be considered in its composite form as a predictive model and should be considered in its composite form as a predictive model.

References:
CVT POSTER DISPLAY
Saturday, June 20
12:00 PM - 1:00 PM

76374 - CROSS-OVER RANDOMIZED DOUBLE BLIND STUDY.
Presenting Author: Mahmoud Moustafa, McGill university, Brossard, Quebec
Primary Author: Francesco Carli, Mcgill University, montreal, Quebec
Co-Authors(s): Per M. Hellstrom, Liane Feldman, Juan Mata, Debora Liotta

80310 - RIGHT ATRIAL HERNIATION FOLLOWING RIGHT EXTRAPLEURAL PNEUMONECTOMY
Presenting Author: Angela Truong, University of Texas MD Anderson Cancer Center, Houston, Texas
Co-Authors(s): Dam Thuy Truong, Dilip Thakar

84383 - KNOWING THE ANGLE OF RUL BRONCHUS BRINGS THE RESURGENCE OF THE R-DLT
Primary Author / Presenting Author: Jean S. Bussières, Institut universitaire de cardiologie et de pneumologie de Québec, Quebec City, Quebec
Co-Authors(s): Lindsay Perron, Michel Gingras, Jacques Somma

84633 - PLATYPNEA-ORTHODEOXIA SYNDROME AFTER EXTRA-PLEURAL PNEUMONECTOMY
Primary Author / Presenting Author: Lorraine Chow, University of Calgary, Calgary, Alberta
Co-Authors(s): Marc de Perrot, Adriaan Van Rensburg

84701 - ADMA/DDAH PATHWAY IN REGRESSION CARDIAC REMODELING WITH ESMOLOL
Primary Author / Presenting Author: Begoña Quintana-Villamandos, Gregorio Marañon General Hospital, Dept of Anaesthesiology & Intensive Care, Madrid, Spain, Madrid, Not applicable, Spain
Co-Authors(s): Ana Arnalich-Montiel, Laia Pazó-Sayós, Rainer Böger, Nicole Lüneburg, Carmen González

84836 - ROLE OF INTRAOPERATIVE TEE IN PULMONARY EMBOLISM
Primary Author / Presenting Author: Nelson Gonzalez, Western University/LHSC, London, Ontario
84953 - CRYSTALLOID VS COLLOID RESUSCITATION ON O2 HOMEOSTASIS IN ANEMIC RATS
Presenting Author: Tiffanie Kei, St. Michael's Hospital, Toronto, Ontario
Primary Author: Gregory M.T. Hare, University of Toronto, St. Michael's Hospital, Department of Anesthesia, Toronto, Ontario
Co-Authors(s): Albert Tsui, Elaine Liu, Allan Doctor, C David Mazer

85037 - BRAIN ANATOMICAL CHANGES AND TISSUE HYPOXIA IN SICKLE CELL ANEMIC MICE
Primary Author / Presenting Author: Gregory M.T. Hare, University of Toronto, St. Michael's Hospital, Department of Anesthesia, Toronto, Ontario
Co-Authors(s): Lindsay Cahill, Albert Tsui, Yu-Qing Zhou, Lisa Gazdzinski, Elaine Liu, C David Mazer, Andrea Kassner, John Sled

85299 - KNOWING THE LENGTH OF THE RIGHT MSB ALLOWS THE SAFE USE OF THE R-DLT
Primary Author / Presenting Author: Jean S. Bussières, Institut universitaire de cardiologie et de pneumologie de Québec, Quebec City, Quebec
Co-Authors(s): Lindsay Perron, Michel Gingras, Jacques Somma

86016 - CONTINUOUS PARAVERTEBRAL BLOCK IN MINIMALLY INVASIVE MITRAL SURGERY
Primary Author / Presenting Author: Chantal Mercier Laporte, University of Montreal, Montréal, Quebec
Co-Authors(s): Jean-Sébastien Lebon, Alain Deschamps, Pierre Couture, Antoine Rochon, Christian Ayoub, Claudia Viens, Jennifer Cogan, André Denault, Georges Desjardins

86242 - IMPACT OF TRANSESOPHAGEAL ECHO IN AORTIC ANEURYSM SURGERY.
Presenting Author: Camila M de. Souza, University of Ottawa, Ottawa, Ontario
Co-Authors(s): Ashraf Fayad

86246 - NSAID USE IN CARDIAC SURGERY
Presenting Author: Alexandra German, Royal Columbian Hospital, New Westminster, British Columbia
Primary Author: Richard Merchant, University of British Columbia, New Westminster, British Columbia
Co-Authors(s): Jocelyn Reimer-Kent, Harman Parhar
86249 - STEM CELLS FOR PRECLINICAL PERIOPERATIVE MI: REVIEW PROTOCOL

Presenting Author: Carly Barron, University of Ottawa/Faculty of Medicine, Ottawa, Ontario

Co-Authors(s): Manoj Lalu, Lauralyn McIntyre, Dean Fergusson, Richard Hall, David Mazer, David Moher, Peter Liu, Duncan Stewart, Homer Yang, The Canadian Perioperative Anesthesia Clinical Trials (PACT) Group
76374 - CROSS-OVER RANDOMIZED DOUBLE BLIND STUDY.

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Introduction: Pre-operative oral carbohydrate-rich drink (12.5% carbohydrate), containing maltodextrins, has been shown to reduce post-operative insulin resistance, without delaying the gastric emptying. The present study was designed to measure gastric emptying following ingestion of a commercially available orange clear drink with or without whey protein.

Methods: The study was approved by the Ethics board and followed a randomized, double-blinded, cross-over design. Twelve (mean age 55.75) otherwise healthy subjects were enrolled in the study. Each subject underwent two 180 min testing sessions where blood samples were taken every 15 min for the easurement of acetaminophen: one following ingestion of orange drink (400 ml. 12.5% carbohydrate) and the other orange with 10 g of whey protein. The two drinks were ingested over the period of 10 min, together with acetaminophen 1.5 g for the determination of gastric emptying by analysis of plasma concentrations.

Results: Absorption of acetaminophen was reduced with whey in 9 and increased in 3, out 12 subjects. In total, absorption was numerically reduced with AUC (13680 umol/L*180 min following orange drink, and 11535 umol/L*180 min following orange drink with whey protein). The gastric emptying rate tended also to be slower with orange and whey (T50 80.2 ±3.8 min) compared with orange alone only (T74.3 ±5.6 min). (NS) At 120 min the retention was 21.0 ± 2.8% with orange drink only and 21.6 ±1.9% with orange + whey.(NS)

Discussion: No delayed gastric emptying was seen with either drinks, suggesting that a commercially available orange drink with or without whey protein may be safely administered 180 min before induction of anesthesia.

References:
1 Scand J Gastroenterol 2000;35:375–379
2 Digestive Diseases and Sciences, Vol. 46, No. 10 (October 2001), pp. 2256–2262
Purpose: To describe a case of right atrial herniation occurring after right extrapleural pneumonectomy.

Clinical Features: Patient consent was obtained in accordance to local institutional guidelines prior to the submission of this case report.

A 63-year-old male with malignant mesothelioma presented for right extrapleural pneumonectomy. He reported productive cough with white sputum, nagging right chest pain, low-grade fever and shortness of breath on minimal exertion. Medical history included chronic obstructive lung disease, gastro-esophageal reflux, and history of deep venous thrombosis. Chest radiograph showed right pleural effusion. He had undergone staging evaluation with bronchoscopy, mediastinoscopy, and thoracoscopy with pleural biopsy.

Right extrapleural pneumonectomy with pericardiectomy and reconstruction of the diaphragm was uneventful. The pericardial defect was repaired with a prosthetic mesh patch. He was extubated and transferred to the intensive care unit (ICU) in stable condition. On postoperative day #1, tachycardia and hypotension were noted. The hypotension showed no sustained response to intravenous fluid and vasopressor administration. A portable chest radiograph revealed a mass in the right hemithorax with marked mediastinal shift consistent with cardiac herniation (Figure 1). The patient was emergently brought to the operating room and the thoracotomy incision was reopened. The right atrium had herniated superiorly through a large opening due to dehiscence of the pericardial patch closure. After the heart was returned to its anatomic position in the pericardial cavity, the patient’s hemodynamics dramatically improved. Additional mesh was used to reconstruct and reinforce the pericardial defect. The patient tolerated the procedure well and was transferred back to the ICU.

Conclusion: Cardiac herniation after pneumonectomy is a rare but life-threatening complication. Predisposing factors include an inadequately closed pericardial defect and an empty right hemithorax after pneumonectomy. Precipitating factors include changes in gravity from positioning the patient in the lateral decubitus with operated side down, increased pressure gradient between left and right hemithoraces from coughing, straining, positive pressure ventilation, PEEP, suction on chest drains, and...
increased abdominal pressure.\textsuperscript{2} The clinical presentation of cardiac herniation ranges from no symptoms to sudden cardiorespiratory arrest. Hypotension, tachycardia, and hypoxemia due to cardiac herniation may be mistaken for hypovolemia, postoperative hemorrhage, congestive heart failure, acute myocardial ischemia, and pulmonary embolism. Heightened awareness and high index of suspicion are needed to establish an early diagnosis. Management of cardiac herniation consists of aggressive hemodynamic support and turning the patient to lateral position with the operated side up.\textsuperscript{3} Definitive treatment requires early surgical re-intervention with repositioning of the heart and closure of the pericardial defect. Awareness and prevention of the precipitating factors for cardiac herniation following pulmonary resection is crucial. Once it occurs, a timely diagnosis and prompt surgical intervention is essential to ensure a favorable outcome.

References:
2. Anaesthesia 1999; 54: 564-566
3. Anesthesiology 1984; 60: 362-364
Knowing the Angle of RUL Bronchus Brings the Resurgence of the R-DLT

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Background: The right-sided double lumen endobronchial tube (R-DLT) is seldom used since positioning its lateral orifice in front of the origin of the right upper lobe (RUL) can be difficult. A few years ago, a publication has suggested that the enlargement of the lateral orifice of R-DLT allowed a better positioning of the R-DLT. At that time, only the clinical intuition has guided the investigators to modify the R-DLT. Now, the angle between the RUL bronchus origin and the right main stem bronchus (RMSB) can be measured with high resolution CT-scan.

Hypothesis: In dorsal decubitus position, the ostium of the RUL bronchus varies from an anterior to a posterior position, from the horizontal plane, on the lateral aspect of the RMSB.

Methods: With local REB approval, we retrospectively evaluated 200 consecutive thoracic CT-Scans. Inclusion criteria were patients aged from 35 to 85 years old. Patients with thoracic or intrathoracic pathologies were excluded. Two investigators, a PGY-4 radiology resident and a staff radiologist, collected the data. Measurement of the RUL bronchus antero-posterior angle from the RMSB was done on axial slices of 2 mm thickness from standard thoracic CT-scan examinations. The slice showing the widest opening of the right upper lobe (RUL) bronchus was the one used for measurement. A first line passing by the center of the RMSB lumen was drawn horizontally. A second line was drawn from the center of the RMSB through the middle of the RUL bronchus. The acute angle between those lines is the RUL angle (figure 1).

Results: 106 CT-scans were analysed. The mean RUL angle is $0.1 \pm 9.5^\circ$ with a $21.2^\circ$ maximal variation in the anterior direction and a $28.6^\circ$ maximal variation in the posterior direction determining a maximal range of $49.8^\circ$. The correlation coefficient between the two observers is 0.89. Discussion: The results of our investigation confirmed our hypothesis of a large range of the orientation of the RUL bronchus ostium (extending from $21^\circ$ anterior to $29^\circ$ posterior to the horizontal plan of the lateral aspect of the RMSB).
Conclusion: This study shows a large variation of the angle of the RUL bronchus. These results explain the utility of a modified R-DLT (with enlarge area of the orifice) discussed in the recent literature.⁴

Figure 1: Axial slice of thoracic CT-Scan

References:


Case Report: A 64 year-old male underwent extrapleural pneumonectomy for mesothelioma. Pre-operative echocardiogram showed normal LV and RV function, with no evidence of pulmonary hypertension (PHTN). There was no patent foramen ovale (PFO), but a bubble study was not performed.

Following an uneventful intraoperative course and confirmation of normal arterial blood gas (ABG) parameters, decision was made to extubate the patient. Almost immediately following extubation, the patient complained of shortness of breath. He was placed in a semi-fowler position to facilitate breathing efforts, which paradoxically worsened his oxygenation. Continuous positive airway pressure (CPAP) at 10 cm H2O did not improve his oxygenation. ABG showed a PO2 of 54 mmHg and oxygen saturation of 85% on 100% oxygen. The patient was re-intubated, and oxygenation improved following ventilation with 100% oxygen in the supine position.

Ventilatory support was weaned as oxygenation improved, but attempts at spontaneous ventilation in the sitting position again resulted in hypoxemia.

TEE showed no pulmonary embolus (PE) with normal RVSP and RV function, but revealed a large PFO with Doppler assessment showing a large R-to-L shunt. The patient was taken to the interventional cardiology suite for closure of the PFO, leading to resolution of hypoxemia.

Discussion: Dyspnea and hypoxemia immediately following pneumonectomy is commonly attributed to decreased alveolar volume, splinting, diaphragmatic dysfunction and atelectasis. Other causes include PE, and more rarely, platypnea-orthodeoxia syndrome.

The hypoxia observed in this syndrome is due to R-to-L shunting across the interatrial septum. One theory suggests that lung resection leads to decreased pulmonary vascular bed and subsequent increased pulmonary vascular resistance, causing a pressure gradient that drives the R-to-L shunt\(^3\). However, this syndrome has also been documented in patients without PHTN\(^3,4,5\). An alternate explanation describes a mechanical distortion following pneumonectomy that causes preferential flow from the
IVC through the PFO into the left atrium\textsuperscript{6}. When upright, the weight of the heart pulls downward on the interatrial septum, causing the PFO to open or widen\textsuperscript{3}.

Diagnosis of this syndrome can include ABG (supine and upright), angiography and MRI. The utilization of bedside TEE in this patient provided a timely diagnosis, and subsequent treatment by transvenous closure of PFO. In patients with unexplained hypoxia following pneumonectomy, the possibility of R-to-L shunting should be considered despite the early time course, and the use of TEE for diagnosis should be considered.

References:

Introduction: Esmolol produces regression of left ventricular hypertrophy (LVH). Increased asymmetric dimethylarginine (ADMA) may be an independent risk factor for development of LVH. We hypothesized that even a 48 hours of esmolol therapy could reduce ADMA in the left ventricle in a model of stable compensated left ventricular hypertrophy.

Methods: Adult male spontaneously hypertensive rats (SHRs) were randomly divided into esmolol therapy group (SHR-E, n= 4) and placebo group (SHR, n=6). Wistar Kyoto rats (WKY) were used as normotensive controls (n= 4). After 48 hours of intervention, left ventricle was removed to study ADMA, SDMA (symmetric dimethylarginine) and DDAH activity (dimethylarginine dimethylaminohydrolase). All the data were expressed as mean ± SEM. Comparisons between groups were made by Student’s t-test for independent samples. P< 0.05 was considered significant. Local Ethics Committee approval was obtained.

Results: SHR displayed a significant increase in ADMA concentration and a decreased DDAH activity compared to WKY. Moreover, ADMA significantly decreased and DDAH activity significantly increased in SHR-E compared to SHR. There were no significant differences in SDMA among SHR, WKY and SHR-E.

Discussion: Our study shows that 48 hours of esmolol therapy produces a reduction of ADMA levels by increasing its hydrolysis. In other words, esmolol is capable of normalizing ventricle’s ADMA and DDAH activity. However, these effects need to be proven in future human clinical prospective studies.

Acknowledgements: This work was supported by a grant from FIS 13/01261.

References:
Pulmonary Embolism (PE) is a relatively common clinical problem that is associated with substantial morbidity and mortality. The incidence in the United States is 100-200 per 100,000 people per year (1) and is the most common cause of mortality that is not clinically diagnosed before death. The current European and American guidelines (2) offer a logical approach for limited context of patient that come to the emergency services. The perioperative environment demands different challenges for the diagnosis and treatment of this entity. Nowadays the Anesthesiologist has a pivotal role either the diagnoses but the treatment of the PE. The Transesophageal echocardiography (TEE) is a relatively simple, minimally invasive and widely available imaging technique.

We present 2 cases where the (TEE) played a crucial role in the management of these patients, and we present the typical and not so typical echo findings associated with these cases that could be useful to cope patients with PE looking for successful perioperative outcomes.

A Woman, 87 years old, with shortness of breath and known PE came to the OR awake but hemodynamically unstable for surgical embolectomy. The TEE demonstrated the typical findings associated with PE including Right Ventricular (RV) dilation (RVEDD/LVEDD) and a disturbed RV ejection pattern. In addition the patient also had an element of dynamic outflow tract obstruction along with systolic anterior motion of the mitral valve leaflet. There are only few reports in the current literature about this complication (3,4).

A Woman, 23 years old, who presented with sudden dyspnea at home and subsequently had a out-hospital cardiac arrest and aspiration. She was resuscitated and later underwent surgical pulmonary embolectomy. The TEE showed clot in the right and left pulmonary arteries, RV dysfunction and McConnell’s sign (depressed contractility on the RV free wall compared with RV apex) prior to the procedure as well as perioperative RV failure due to hypercapnia. The TEE was also an objective tool for assessment and following after the surgical embolectomy and successful Broncho-pulmonary Lavage.
Anesthesiologist are frequently being called to assess hemodynamically unstable patients with the use of either TEE or TTE. Pulmonary embolism is one differential diagnosis that should be considered. Unfortunately only half of patients have clot demonstrable on ultrasound perioperatively (5). For this reason other signs of PE qualitative and quantitative are frequently sought, and include RV systolic pressure (RVSP), RV end diastolic wall thickness, paradoxical interventricular septal motion, RV end-diastolic dimension (RVEDD) and the relation with the Left Venticule (RVEDD/LVEED >0.7), Tricuspid annular plane systolic excursion TAPSE, Inferior Vena Cava Dimension and collapsibility and RV longitudinal strain and strain rate by speackle-tracking echo(6). Finally, the use of thoracic imaging to identify sub pleural infarcts is also suggestive of PE. The usefulness of this signs remains unclear.

We describe and discuss the typical TEE findings in with PE in the operating room for diagnosis purposes, treatment and the potential prognosis implications.(6)

References:

2. Eur Heart J. 2014 Nov 14;35(43):3033-69
4. Echocardiography. 2010 Nov;27(10):E122-4
84953 - CRYSTALLOID VS COLLOID RESUSCITATION ON O2 HOMEOSTASIS IN ANEMIC RATS

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Introduction: Anemia and hemodilution during surgery are associated with an increased risk of morbidity and mortality (1-3). Acute hemorrhage and fluid resuscitation occurs commonly during surgery. Common intravenous fluids used to restore blood volume during acute hypovolemia include colloids such as hydroxyethyl starch (HES), and crystalloids such as saline. There remains extensive debate over the optimal indication and volume of colloids and crystalloids clinically. In an experimental model, we aimed to compare the effects of acute normovolemic hemodilution with HES or saline on oxygen homeostasis by utilizing 1) novel approach (G4 Oxyphor) to directly assess brain and muscle tissue PO₂ and 2) traditional approach (blood lactate and oxygen extraction) to measure tissue hypoxia.

Methods: With institutional animal care committee approval, 21 anesthetized rats underwent 40% isovolemic hemodilution with either hydroxyethyl starch (HES) (n=10) or saline (n=7) to reach hemoglobin level of 70-80g/L. An additional 4 rats were placed in the sham control group. Brain and hind limb skeletal muscle tissue oxygen tension were measured using a microprobe containing phosphorescence (G4 Oxyphor). Mean arterial pressure (MAP), heart rate, temperature and standard hematological parameters were assessed at baseline, throughout the 10 minute hemodilution period, and for the following 60 minutes. Data were analyzed by repeated measures one-way ANOVA.

Results: Following HES hemodilution, MAP and muscle PO₂ remained stable while brain PO₂ decreased from 22.1 (5.6) to 17.5 (4.4) mmHg (p < 0.05). Arterial and venous oxygen saturation were not different from controls and systemic lactate did not increase. By contrast, fluid resuscitation with saline resulted in a drop in MAP from 77.3 (4.0) to 31.2 (12.8) mmHg (p < 0.05), and a significant reduction in both muscle PO2 [44.5 (11.0) to 19.9 (12.4) mmHg] and brain PO2 [23.2 (8.2) to 10.7 (3.6) mmHg, p < 0.05]. Blood gas analysis demonstrated a reduction in venous blood PO2 [47.9 (4.3) to 23.6 (5.1) mmHg, p < 0.05] and arterial lactate levels increased form 3.5 (1.3) to 10.9 (6.2)
mmol/L, p < 0.001). Heart rate and temperature remained constant in all groups at all time points.

**Discussion:** Our findings demonstrated that hemodilution with saline results in greater degree of tissue hypoxia relative to HES. This is primarily due to the inability of saline resuscitation (1:1) to maintain MAP. This resulted in severe tissue hypoxia in brain and hind limb, increased oxygen extraction, and elevated blood lactate. With stable MAP in HES hemodilution, tissue hypoxia was observed in the brain, likely due to its higher metabolic requirement. Resting muscle metabolism is relatively low, thus tissue hypoxia was not observed. The result of this study demonstrated that HES is superior than saline for 1:1 fluid replacement in extreme hemodilution in our animal model. Tissue hypoxia occurs in a heterogeneous manner that is partially dependent on specific tissue metabolism.

**References:**
1) Anesthesiology. 2009 Mar;110(3):574-81
2) Circulation. 2008 Jan 29;117(4):478-84
Introduction: Cerebral ischemia commonly occurs in children with sickle cell disease (SCD), and is a common cause of morbidity in these patients (1). Impaired learning and cognitive function are also observed in these young patients, suggesting that anemia causes impairment in neurological function (2,3). However, the mechanism of cerebral injury is poorly understood. We hypothesize that anemia-induced tissue hypoxia may be an important factor contributing to the changes in cerebral blood flow (CBF) and cerebrovascular reserve (CVR) in SCD. The purpose of this study is to utilize a transgenic mouse model of SCD to recapitulate the anatomical and functional changes observed in SCD patients, and to provide evidence of tissue hypoxia in sickle cell anemic mice.

Methods: With institutional animal ethics approval, female heterozygous Townes sickle cell mice and C57BL6/J control mice were used. At 6-7 weeks old, CBF and CVR were assessed with magnetic resonance imaging (MRI) using continuous arterial spin labeling by exposing mice to normocapnia (30% O2 / 70% N2) and hypercapnia (5% CO2 / 30% O2 / 65% N2). At 13 weeks of age, blood flow and diameter of the left common carotid artery (LCCA) were measured using high-frequency ultrasound. The mouse brain was then perfusion fixed for ex vivo magnetic resonance imaging (MRI) and immunofluorescence staining for hypoxia-inducible factor (HIF). Brain Anatomical Changes and Tissue Hypoxia in Sickle Cell Anemic Mice

Results: Basal CBF in sickle cell mice was significantly elevated relative to control mice (9.6 ± 0.7 vs 6.8 ± 0.8 ml/g/min; p < 0.05). Cerebrovascular reactivity to CO2 was reduced by 67% in the whole brain, 44% in the cerebral cortex and 85% in the hippocampus of sickle cell mice (p < 0.05 for all), relative to control mice. Ultrasound measurements demonstrated that sickle cell mice had significantly increased LCCA diameter (0.68 ± 0.06 vs 0.38 ± 0.05 mm; p < 0.001) and blood flow (2.19 ± 0.55 vs 0.68 ± 0.23 ml/min; p < 0.001). Ex vivo MRI analysis demonstrated significant volume differences in specific
regions in the grey and white matter of the brain. Increased HIF-1α staining was clearly evident in the perivascular regions of sickle cell mice relative to controls. Brain Anatomical Changes and Tissue Hypoxia in Sickle Cell Anemic Mice

**Discussion:** We demonstrated that the transgenic SCD mice exhibit evidence of tissue hypoxia (HIF staining), elevated basal CBF, impaired functional cerebrovascular reactivity to CO2, and morphological changes in the brain consistent with anemia-induced tissue hypoxia. An enlarged carotid artery may suggest vascular remodeling in chronic anemia, and the MRI analysis demonstrated atrophy of specific brain regions involved in learning and memory in SCD mice. Together, these findings suggest that disrupted oxygen homeostasis caused functional and structural adaptation in SCD mice. These changes in the brain function and structure may contribute to cerebral injury in children with SCD and may help define novel treatments to prevent stroke in children with sickle cell anemia.

**References:**
2) Neurology 2001; 56(8): 1109-11
3) Pediatric Hematology and Oncology 2008; 25(5): 409-21
KNOWING THE LENGTH OF THE RIGHT MSB ALLOWS THE SAFE USE OF THE R-DLT

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Background: The right-sided double lumen endobronchial tube (R-DLT) is seldom used. The variable length of the right main stem bronchus (RMSB) is the principal cause of reticence for using the R-DLT. The right upper lobe (RUL) bronchus can originate directly into the trachea or proximally into the RMSB. There was no guideline to determine which level of insertion in the RUL bronchus is acceptable for the safe positioning of the R-DLT until Kim et al. described that a length of RMSB ≤ 23 mm should preclude the successful use of a R-DLT. This measurement done on CT-scan is complex.

Objectives: To determine the distribution of RMSB’s length and to measure the distance between the tracheal carina and the interlobar carina (method A) that corresponds to the Kim’s measurement of 23 mm (method B).

Methods: With local REB approbation, we retrospectively evaluated 200 consecutive thoracic CT-scans. Patients with thoracic or intrathoracic pathologies were excluded. Two investigators, a PGY-4 resident and a staff radiologist, collected the data. Measurement of RMSB’s length was done on the coronal plan with a resolution of 2 mm thickness in the axis of the RMSB according to the two methods: A-proposed measure: distance between tracheal carina and interlobar carina (superior and middle bronchus) (fig 1A) and B-reported measure: distance between tracheal carina and distal margin of the RUL bronchus (fig 1B).

Results: 106 CT-scans were analysed. The mean length of RMSB (method B) is 25.5 ± 4.7 mm (range 13.5 to 39.0 mm) and 36% are less than 23 mm. The ROC curve shows that 27.85 mm obtained with method A corresponds to the 23 mm described by Kim (method B), with a sensitivity of 80% and a specificity of 100%. The relation between the two methods is: «Reported measure (mm) = Proposed measure (mm) * 0.95 - 2.45». The intraclass correlation coefficient between the two observers for method A is 0.95 and for method B is 0.84 (p < 0.0001).
**Discussion:** The method A would be useful in clinical practice as it helps to determine when a R-DLT should not be used or used with caution when facing a proximal implantation of a RUL bronchus.

**Conclusion:** The proximal position of the (RUL) bronchus in the RMSB (< 23 mm) occurs in 36% of the cases. The method A showed that an interlobar length of < 28 mm corresponds to a length of RMSB < 23 mm and should alert the anesthesiologist to use a R-DLT with caution. Method A has a better correlation between observers, is more reproducible, and is easier to perform (only one measure) than method B (needs 3 lines, 2 angulations, and one measure).

**Figure 1 : Methods of measurement**

**References:**

Minimally invasive mitral valve surgery (MIMS) through a small thoracotomy is linked to faster recovery\(^1\). However, it is associated with pain in the immediate post-operative period that is more severe than a sternotomy\(^2\). We hypothesized that the addition of a continuous paravertebral bloc (CPVB) or a continuous intercostal bloc (CIB) would provide superior pain control and lower need for opioid after MIMS.

After institutional approval, charts of patients admitted for MIMS since 2012 were reviewed. We excluded patients with conversion to sternotomy, reoperation in the first 48 hours, chronic use of opioids and inability to evaluate pain.

Primary end points were numeric pain scores (NPS) at rest and upon mobilisation in the first 48 hours after surgery. Adequate pain control was defined as a NPS of 3 or less. NPS were obtained from the intensive care nursing charts on the day of the surgery and from postoperative pain service on subsequent days. Quantity of opioid received was calculated and converted to morphine equivalent. Adverse effects associated with opioid consumption and coanalgesic administration were also noted.

177 charts were reviewed. 141 were kept for analysis. Of those, 90 had CPVB, 28 CIB and 23 PO opioid only. Demographic and chirurgical characteristics were similar in all groups except that more women, atrial fibrillation and MAZE procedure were found in the CIB group.

Data analysis revealed that more patients in CPVB or CIB group had adequate pain control upon mobilisation on the first (CPVB 59.4% CIB 69.6%, opioid 30.0% p=0.0225) and second post-operative day (CPVB 78.9%, CIB 78.3%, opioid 50% p=0.0388). However, no statistical difference was found between groups for pain at rest during the first 48h after surgery. A tendency to less adequate pain control was seen in the opioid
Opioid consumption was higher during the first 24 hours after surgery then on subsequent days in all groups (p=0.0001). Patients with CPVB had statistically lower need for opioid to achieve adequate pain control on both days (p=0.0071). Patients in the opioid group received ketamine more frequently to achieve adequate pain control (p=0.0137). No difference was found in duration of intubation and incidence of nausea. No Ramsey score ≥5 was recorded in any group. However, 2 patients required instrumentation for upper airway obstruction in the opioid group (p=0.0055).

In conclusion, after MIMS, patients with CPVB and CIB have better pain control upon mobilisation. Patients with CPVB need significantly less opioid to achieve adequate pain control at rest. However, a prospective randomised study is needed to confirm which pain control strategy is best suited for MIMS.

References:
2 Pain Medicine July 2010 36: 7
Introduction: Despite advances in surgical and anesthetic techniques, perioperative management of patients undergoing abdominal aortic aneurysm (AAA) open repair represents a major challenge. Invasive and non-invasive monitoring may be required to achieve optimal hemodynamic management and minimize cardiovascular adverse events. Transesophageal echocardiography (TEE) is a powerful diagnostic and monitoring tool in assessment of hemodynamics during major surgical procedures. The aim of this study is to evaluate the impact of TEE on the outcomes of patients undergoing elective AAA open repair.

Methods: After obtaining REB approval, a retrospective study was conducted. The study includes patients undergoing elective open AAA surgery from December 2009 to December 2014. Emergency and endovascular repair cases were excluded. Utilization of TEE in our institution for AAA surgeries is based on the availability of qualified echocardiographers. The study is aimed to divide the patients into two groups: control group (C) didn't have intraop TEE and echocardiography group (E) had hemodynamics managed based on TEE findings. The two groups were then compared for cardiovascular adverse events (primary outcome). The primary outcome were defined as myocardial infarction (MI), pulmonary edema (PE), stroke, arrhythmia (that required treatment) and in-hospital mortality. Secondary outcomes include: intensive care unit (ICU) length of stay (LOS), length of ventilation (LOV), intraoperative fluids balance and incidence of acute renal failure (RF). The charts of all eligible patients will be manually reviewed and descriptive statistics will be used to summarize the characteristics of the two groups. Primary outcomes will be compared using chi-square statistics. Further logistic regression analysis will be conducted for secondary outcomes.

Results: A total of 226 patients were deemed to meet the inclusion criteria. So far 30 records have been reviewed. Chart reviews are expected to be completed in the coming weeks. Demographic data of the first 30 patients are presented in Table I. The reported cardiovascular events and secondary outcomes are presented as follows: Group E (n=12) had 1 PE and Group C (n=18) had 4 PE. Additionally 4 patients developed arrhythmias in Group C vs none in Group E. ICU LVO was 0 minutes in 83% of Group E vs 72% in Group C. The incidence of renal failure was 8.3% in Group E vs 50% in Group C. The average ICU LOS was 74+-43 hours and 92+-63 hours in Group E and Group C respectively.
**Conclusion:** The preliminary data of this study suggests that TEE may have significant impact in reducing perioperative cardiovascular adverse events in patients undergoing AAA open repair

**References:**
86246 - NSAID USE IN CARDIAC SURGERY

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Introduction: A 500 bed tertiary care centre has been performing cardiac surgery since 1991. In 1996, a multidisciplinary quality improvement team created an innovative and cost-effective rapid surgical recovery program (RSR), using philosophies similar to current Enhanced Recovery After Surgery (ERAS) programs. The RSR model emphasized early extubation and proactive treatment of pain, nausea, bowel dysfunction, and immobility helping to dramatically increase the case load (mid 200s to the mid 900s). Due to the opioid-sparing effect of non-opioids, the proactive pain management plan utilized maximal non-opioids including non-steroidal anti-inflammatory drugs (NSAIDs), unless contraindicated, which were supplemented with an opioid as needed. With this protocol >70% of patients received 3 or more indomethacin suppositories, the average postoperative length of stay was 5.9 days, 70% of patients were discharged on day 4 or 5 and delirium was less than 1%. In the 18 years since RSR was instituted the program has seen many changes in terms of new team members and case complexity and the use of NSAIDs has been called into question. We elected to review recent practice to assess this change.

Method: To assess this change in practice clinical ethics board approval was obtained to conduct a retrospective chart review of consecutive patients undergoing isolated coronary artery bypass surgery. A variety of demographic and clinical variables were extracted from 109 charts (2008) and 142 charts (2013).

Results: Patients from 2008 and 2013 were comparable in regards to age, sex, BMI, and a crude count of comorbidities (diabetes, kidney disease, etc). The surgical classification revealed significantly more urgent/emergent cases in 2013. NSAIDS were used in 78% of patients in 2008 versus 22% in 2013. No significant difference was found between the two groups for change in renal status (highest creatinine (Cr), Cr change, Cr at discharge, RIFLE criteria). Dialysis was instituted in 8 patients, all non-NSAID. Excluding long-stay outliers, delirium was recorded as 9% for NSAID patients versus 18% for non-NSAID patients. The average maximum pain score (0 to 10 verbal analogue scale) was 3.8 for NSAID patients versus 5.2 for non-NSAID patients.
Discussion: Clinical practice constantly evolves as circumstances and people change. Review of clinical practice helps assess whether such changes provide the anticipated benefits. As for other programs, our patient population has become more complex, and concern for the potential for complications has modified treatment programs. The data available here, with all the drawbacks of a retrospective chart review, suggest that the use of NSAIDs has not been associated with increased complications but rather withholding NSAIDs is associated with some specific poorer outcomes. Further insight would warrant a prospective study.

References:
86249 - STEM CELLS FOR PRECLINICAL PERIOPERATIVE MI: REVIEW PROTOCOL

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The Canadian Perioperative Anesthesia Clinical Trials (PACT) Group

Background: The incidence of perioperative myocardial infarction (POMI) is 6% in at risk patients and is associated with a 30 day mortality of 10-11%. The burden of POMI will only increase in Canada given an aging population and a growing number of patients undergoing major surgery. There is preclinical evidence that mesenchymal stromal cells (MSCs, ‘adult stem cells’) represent a promising new therapy for POMI. These stem cells have potent anti-inflammatory and organ protective effects. Prior to considering a first-in-human clinical trial, a systematic review of preclinical evidence is needed to summarize the efficacy and safety of MSCs in animal models of POMI. Our systematic review will answer the question, “In preclinical models of POMI what effect do MSCs (in comparison to control therapy) have on cardiac function, infarct size, inflammation, and death?”

Methods/Design: No ethics approval was necessary as this is a review of published preclinical literature. This systematic review protocol will be registered with CAMARADES website (www.CAMARADES.info) prior to data analysis. Electronic searches of MEDLINE, Embase, BIOSIS, and Web of Science were constructed in consultation with an information specialist and reviewed by the Peer Review of Electronic Search Strategies (PRESS) process. Two independent reviewers will review studies and extract data into standardized, piloted forms. Discrepancies will be resolved through discussion with a third team member. Eligible studies include controlled comparative studies (randomized and non-randomized) of preclinical in vivo models of MI in which MSCs are administered within 7 days of disease induction. The primary outcome will be left ventricular ejection fraction. Secondary outcomes include death, infarct size, cellular infiltration, apoptosis and MSC retention and differentiation biochemical outcomes such as proinflammatory cytokines, anti-inflammatory cytokines, growth factors and chemokines. Results from outcomes with discrete data (e.g. death)
will be pooled and meta-analysis will be performed with inverse variance random effects modeling. Continuous endpoints (e.g. cytokine levels) will be pooled using the ratio of weighted means method with inverse variance random effects modeling. Data will be expressed as odds ratios and 95 percent confidence intervals. Risk of bias will be assessed using the SYRCLE risk of bias tool for animal studies, and individual study reporting will be assessed according to the Animal Research: Reporting of In Vivo Experiments (ARRIVE) guidelines. Results of this systematic review will reported in accordance with the PRISMA reporting guidelines. Knowledge users have been identified and have agreed to participate in dissemination of results. These include the Canadian Perioperative Anesthesia Clinical Trials Group, the Canadian Society for Atherosclerosis, Thrombosis, and Vascular Biology, and the Canadian Stem Cell Foundation. To date, ~25% of data has been extracted.

Discussion: This systematic review of preclinical evidence will summarize the efficacy and safety of MSCs in animal models of MI. The results will aid in determining whether sufficient evidence exists to conduct a clinical trial and guide future POMI research.
EDUCATION AND SIMULATION POSTER DISPLAY
Saturday, June 20
12:00 PM - 1:00 PM

82474 - SURVEY OF PROGRAM DIRECTORS ON RESIDENT TRAINING IN SMOKING CESSATION
Primary Author / Presenting Author: Ushma Jitendra. Shah, Toronto Western hospital, Toronto, Ontario
Co-Authors(s): Michelle Harris, David T Wong, Mark Levine, Frances Chung, Jean Wong

83197 - IMPACT OF NAME TAGS ON ANESTHESIA RESIDENTS' AWARENESS IN SIMULATION.
Presenting Author: Issam Tanoubi, Centre d'Apprentissage des Attitudes et Habilétés Cliniques (CAAHC) - Faculté de médecine de l'Université de Montréal, Montreal, Quebec
Co-Authors(s): Marie-Ève Bélanger, Arnaud Robitaille, L.Mihai Georgescu, Pierre Drolet

84761 - A CANADIAN NATIONAL ANESTHESIOLOGY SIMULATION CURRICULUM (CANNASC)
Primary Author / Presenting Author: Michelle Chiu, Department of Anesthesiology, University of Ottawa, Ottawa, Ontario
Co-Authors(s): Jordan Tarshis

85107 - CANADIAN ANESTHESIOLOGY DEPARTMENT PUBLICATION OUTPUT: 2000-2013
Primary Author / Presenting Author: Darren Lam, Department of Anesthesiology & Pain Medicine, University of Alberta, Edmonton, Alberta
Co-Authors(s): Ban C.H. Tsui, Ban Tsui

86191 - MASTERY LEARNING VERSUS TIME-BASED EDUCATION: BLS SKILL RETENTION
Primary Author / Presenting Author: Sylvain Boet, The Ottawa Hospital, ottawa, Ontario
Primary Author: Karl Schebesta, Medical Simulation and Emergency Management Research Group, Department of Anaesthesia, General Intensive Care and Pain Management, Medical University of Vienna, Vienna,, Austria
Co-Authors(s): M. Dylan Bould, Pratheeban Nambyiah, Li Qi, Bryan Abraham, Alexandra Bunting
SURVEY OF PROGRAM DIRECTORS ON RESIDENT TRAINING IN SMOKING CESSATION

Author(s)
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David T Wong - Toronto Western Hospital, Toronto Canada
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Background: Smoking is a modifiable risk factor for perioperative complications. Residents of various medical and surgical specialties have the opportunity to interact with the patients in the perioperative period and have an opportunity of a “teachable moment”. However, there is limited knowledge about the training for smoking cessation received by the Canadian residents in the different specialties of anaesthesiology, family medicine, internal medicine and surgery. This survey of Canadian Program directors aims to identify the format of the current and future curriculum of smoking cessation training for residents in the different specialties.

Methods: A national survey of Canadian program directors of anesthesia, family medicine, internal medicine and surgical specialties was conducted with an online survey tool after appropriate approval by Research Ethics Committee. The survey consisted of eight questions pertaining to the demographics, current and future curriculum.

Results: One hundred and twenty-nine Canadian postgraduate programs directors were invited by emails to participate in the online survey. Overall, the Program director response rate was 60% (76/126). Responders were from family medicine 36.5% (46/126), anaesthesiology 13% (17/126), internal medicine 9.5% (12/126) and surgical specialties 17% (21/126).

From the program directors responses regarding current resident curriculum, 62% (49/79) agreed that the curriculum trained residents in asking patients about tobacco use, 29% (23/79) in assessing the role of tobacco in causing perioperative complications and only 18% (14/79) responded that the curriculum provided training to assist patients to quit smoking in perioperative period.

Eighty two percent (63/77) of the program directors agreed that the future curriculum should include training residents to assist patients to quit smoking. Currently only 20% (15/74) of program directors said that they have a program at their institution to provide tobacco interventions to surgical patients.
Discussion: The survey highlights the gap in the current perioperative tobacco control curriculum in Canadian residency programs. At the same time, the attitudes of program directors were generally positive towards incorporating education about tobacco cessation in the perioperative period and tobacco control interventions in residency curriculum. Addressing the gap in education about this important public health problem will allow residents to be better equipped to be able to help patients quit smoking, which ultimately may have a significant effect on both short-term surgical outcomes and the long-term health of patients. This initiative had already been taken in paediatric speciality with positive results.\textsuperscript{4}

References:


83197 - IMPACT OF NAME TAGS ON ANESTHESIA RESIDENTS’ AWARENESS IN SIMULATION.

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Introduction: Obtaining and maintaining the commitment of participants in a high fidelity (Hi-Fi) simulation is essential for a better learning experience. We investigated whether wearing name tags and place identification during Hi-Fi simulation leads to better residents’ commitment and situational awareness.

Methods: Six simulation sessions were scheduled with 25 anesthesia residents unaware of the exact topic of the study. Each session ran for 4 hours during which 2 Hi-Fi simulation scenarios (a massive amniotic fluid embolism case and a postoperative malignant hyperthermia) took place with the same participants. A randomization table was used to prospectively designate in what order the scenarios would be conducted. In the first scenario run (control scenario), participants wore no name tag and there was no indication as to the location where the scenario was supposed to take place. For the second scenario (intervention scenario) run during the session, trainees had to wear name tags stating their actual roles and a sign identifying the physical location in which the scenario was to take place was posted at the entrance of the simulator. At the end of each scenario, each participant completed a 6-question survey using a 7-point Likert scale in order to evaluate their role and location awareness at the beginning and during the case as well as their overall emotional engagement and commitment level (local 0-10 scale). Later, a specially trained auditor unaware of the scenarios’ sequence listened to the soundtrack (without the visual) of the videos in search of specific indicators related to participants poor situational awareness.

Results: The subjects’ assessment of their own awareness regarding their roles or location at the beginning and during the case was not influenced by the intervention (name tags and formal indentification of scenarios’ location). The emotional implication and the subjects’ perceived realism leading to learning engagement was not modified by the intervention either. The intervention had no effect on the residents’ learning engagement (Wilcoxon matched-pairs signed rank test, figure). Number of indicators suggesting poor situation awareness was not statistically different between groups (Chi-square test).
**Conclusion:** Our study suggests that wearing name tags during Hi-Fi simulation scenarios does not improve trainees’ perception of their own situational awareness or commitment. Nevertheless, the usefulness of name tags or formal participants identification should be discussed in terms of learners and scenarios characteristics as well as educational objectives.

Registered clinical trial: Clinicaltrials.gov reference number NCT02105883

**References:**

Medical teacher. 27(1):10-28.

International maritime health. 62(4):258-64.

Simulation in healthcare. 2(3):183-93.

Simulation in healthcare. 8(3):143-7.
Introduction: The introduction of competency-based medical education will task educators with ensuring that trainees gain proficiency in managing a wide range of rare but critical clinical events. Despite widespread adoption of simulation, there is large variability in curriculum content and trainee assessment across training programs. The purpose of this project is to develop and implement a set of standardized high-fidelity simulation scenarios to be completed by every senior anesthesiology trainee during residency.

Methods: The local Research Ethics Board waived the need for ethics review for this project. In 2013, the Royal College Office of Health Systems Innovation and External Relations and Anesthesiology Specialty Committee assembled a task force of educators representing the 17 anesthesiology training programs in Canada. The CanNASC Task Force’s goals were to design, implement and continually evaluate a national, standardized simulation-based curriculum comprising: 1) rare, but important clinical situations that may never be experienced in residency, and 2) clinical situations that are critical to competency as an anesthesiologist. Curriculum development followed the principles described by Kern\(^1\) and were accomplished via monthly teleconferences and annual face-to-face meetings.

Results: The following has been achieved:
1) Needs assessment for curriculum content: Every Canadian resident, program director, simulation instructor, residency program committee member and education vice-chair was invited to participate in an online survey. 368 of 958 invitees responded (38.4%), resulting in 64 suggested scenario topics. Using a modified Delphi technique, the Task Force achieved consensus on important and technically feasible scenarios. These 7 scenarios are called CanNASC Simulation Milestones (Table 1).
2) Scenario development: All scenarios have learning objectives grounded in the National Curriculum for Canadian Anesthesiology Residency\(^2\). Standardized scenario templates were created and 1 scenario has been developed and piloted.
3) Assessment strategy: A published Global Rating Scale (GRS)\(^3\) is the primary tool for assessment of competence; it will be informed by the use of scenario specific checklists (created via a modified Delphi technique) and the ANTS GRS\(^4\).
4) Implementation strategy: Standardized scenario implementation guidelines, pre-brief / debrief documents and rater training videos, guide and commentary were generated. A national simulation resource survey was done to assess for implementation feasibility.
National implementation of a CanNASC Simulation Milestone scenario is currently underway.

Discussion: It is highly feasible to achieve consensus on the elements of a national simulation-based curriculum for anesthesiology trainees. Our process could be adapted by any specialty interested in implementing a simulation-based curriculum incorporating competency-based assessment on a national scale. Data collection on nationwide implementation of the CanNASC Simulation Milestones is underway with future plans for program evaluation and analyses of elements of standardization and performance across the country.

References:

Introduction: Academic output in anesthesiology has been quantified in the past, and concerns regarding a decline have arisen in multiple countries. Our previous analysis of the academic output of anesthesiology departments across Canada between 2000 and 2004 identified a potentially concerning decline in the number of randomized clinical trials (RCTs). Also concerning is a recent report by the Canadian Association of University Teachers which revealed that the Canadian Institutes of Health Research budget fell 7.5% between 2007 and 2013. Here, we analyzed research from Canadian anesthesiology departments published between 2000-2013 to assess long-term productivity trends and effects of funding decreases on publication numbers.

Methods: Publications from 2000-2013 which listed Canadian anesthesiology departments as the primary corresponding source were identified using MEDLINE and categorized into methodological study designs following abstract review by two independent reviewers. Pearson correlation coefficient analysis was performed on the number of total publications, publications by study design, and publications by each university. Average annual percent change (AAPC) and annual percent change (APC) were calculated using Joinpoint Regression for the total annual number of anesthesiology publications as well as total annual number of RCTs.

Results: Between 2000 and 2013, we identified 2,940 published articles authored by a member of an anesthesiology department of a Canadian university or affiliated hospital. There was a trend towards increased publications by Canadian anesthesiology departments (r = +0.91) between 2000 and 2013. There was a slightly positive trend (r = +0.17) in number of RCTs published from 2005-2013; however, RCTs as a percentage of total publications showed a declining trend between 2000 and 2013 (Figure 1). APC analysis showed an average annual increase of 5.2% [95% CI 3.8-6.5] in total publications from 2000-2013 (α = 0.05); however, no Joinpoints were found, indicating that no major year-to-year changes accounted for this increase.

Discussion: Our results reveal a steady increase in total publications and RCTs over the 14-year period analyzed. Our results also show a slight decline in the percentage of RCT publications among total publications. Nevertheless, these results are reassuring since they suggest that anesthesiology research productivity, at least in terms of publication numbers, increased even as federal funding for biomedical research
declined during the latter part of our period of analysis. However, it is difficult to assess whether the funding decline affected publication quality. A limitation of our study is that our methodology only allowed us to identify publications based on the corresponding author, which may overlook large, multi-centre studies involving Canadian anesthesiology departments.

Figure 1. Yearly numbers of total publications overall (white bars) and randomized controlled trials (RCTs) only (gray bars) for the period 2000-2013. Per-year percentage of total publications that were RCTs is represented by filled circles; the trendline shows the overall decrease in percentage of publications that were RCTs from 2000-2013.

References:
4: Anaesthesia. Dec 2002;57(12):1213-1214
5: Anesthesia and analgesia. Feb 2003;96(2):513-517
86191 - MASTERY LEARNING VERSUS TIME-BASED EDUCATION: BLS SKILL RETENTION

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Background: Teaching basic life support (BLS) to laypeople is integral to improving survival after out-of-hospital cardiac arrest. However, retention of these skills after BLS training is poor. The mastery learning (ML) based educational approach is shown to be valuable in other healthcare domain. We aimed to compare the effectiveness of two distinct learning strategies for the retention of BLS skills – a traditional time-based learning approach versus mastery learning.

Methods: This study is a single-blinded randomized controlled trial approved by our local hospital and university REB. Forty-nine laypeople without previous BLS training were recruited from the science faculty of our university and were randomized to either traditional time-based (TB) BLS course group or mastery learning-based (ML) group. Both groups received a six-station BLS training course including diagnosis of cardiac arrest, chest compression, ventilation, single-rescuer BLS, AED use and choking (adult CPR and AED only). In the ML group, subjects received feedback at each station and only passed on to the next station when they achieved a predetermined level of competence. In the TB group, the same six stations were taught in two hours, as is standard for BLS teaching. Subjects were assessed using a knowledge test and simulated scenario immediately after teaching (immediate post-test) and at four months (retention post-test). All scenarios were video recorded and assessed by two blinded, independent expert raters.

Results: 46 participants completed the study. Results are presented in Table 1. Videos are currently being rated by blinded, independent raters for assessment of skills at immediate post-test and retention post-test. Detailed study results will be available for the CAS conference.
**Conclusion/discussion:** The difference in course duration was not clinically relevant and the ML-based BLS course is not better than the traditional BLS course with regards to the knowledge retention in laypeople. However the results of the skill testing may lead to important changes in the way BLS training is designed and delivered internationally. Ultimately, the aim of such research should be to improve patient outcome, and it is likely that improved skill retention of BLS skills amongst laypeople will ultimately improve survival after out-of-hospital cardiac arrest.

**References:**

EQUIPMENT/MONITORING POSTER DISPLAY
Sunday, June 21
11:30 AM - 12:30 PM

78796 - REDUCING BARRIERS TO CAPNOGRAPHY MONITORING DURING CARDIAC ARRESTS
Primary Author / Presenting Author: Ekta Khemani, University of Toronto, Mississauga, Oregon
Co-Authors(s): Natalie Wong

82777 - MECHANICAL STRENGTH AND STIFFNESS OF SINGLE USE LARYNGOSCOPE BLADES
Primary Author / Presenting Author: Ravi Pullela, Dalhousie University Department of Anesthesia, Pain Management and Perioperative Medicine, Haifax, Nova Scotia
Co-Authors(s): Paul Brousseau, Esther Valliant, Andrew Milne

86022 - HYPERFIBRINOLYSIS IN LIVER TRANSPLANTATION
Primary Author / Presenting Author: Tomasz Bartkowiak, Toronto General Hospital, Toronto, Ontario
Co-Authors(s): Stuart McCluskey, Srinivas Coimbatore, Akhil Kant Singh, Marcin Wasowicz

86032 - COMPARISON OF THREE METHODS TO PREPARE ZEUS ANESTHESIA MACHINE FOR MHS
Primary Author / Presenting Author: Victor M. Neira, University of Ottawa. Children's Hospital of Eastern Ontario, Ottawa, Ontario
Co-Authors(s): Khristine George, Waleed Al Madhoun, Nicholas Barrowman, Kevin Nolan

86143 - USE OF BED-SIDE ULTRASONOGRAPHY TO DIAGNOSE IATROGENIC PNEUMOTHORAX
Primary Author / Presenting Author: Timothy van Haaften, Toronto General Hospital, UHN, Toronto, Ontario
Co-Authors(s): Martin Ma, Adriaan Van Rensburg

86252 - SONOGRAPHIC EVALUATION OF URINARY CATHETER PLACEMENT IN A NEWBORN
Primary Author / Presenting Author: Eiman Rahimi, University of Manitoba, Winnipeg, Manitoba
Co-Authors(s): Sreekrishna Raghavendran
REducing BARRIERS TO Capnography Monitoring DURING Cardiac ARRESTS

Introduction: Current Advanced Cardiovascular Life Support (ACLS) Guidelines highlight the importance of quality cardiopulmonary resuscitation (CPR) using physiologic monitors such as capnography monitoring (CM) during cardiac arrests. Little is known about adherence to the guidelines, and barriers, if any, to using CM during CPR. The purpose of this study was to assess the current use of CM at our institution, and potential barriers to its use.

Methods: REB approval was obtained. A retrospective chart review and defibrillator data review of all cardiac arrests from September 2013-February 2014 was performed; capturing the frequency of CM, length of time to implement CM, and any documentation for not using CM. Duration of arrests using CM were compared to all arrests using an independent samples t-test. A survey using a 5-point likert scale was administered to all respiratory therapists (RTs) at our institution (n=70) to further explore potential barriers to implementing CM during arrests. Results were summarized using descriptive statistics. The survey included a comments section that was qualitatively analyzed for themes.

Results: Data was available for 51 cardiac arrests between September 2013-February 2014 at our institution, with CM used 29% (15/51) of the time. The average time to implementing CM was 10.71 ± 4.1 minutes. The most frequent reasons for not using CM were 1) arrest resolved prior to use (48%), 2) forgot (18%), and 3) CM equipment not available (15%). The average duration of arrests using CM were compared with all arrests (16.8 ± 7.1 minutes vs. 18.9 ± 11.1), which was not significantly different (p=0.467). For the survey portion of the study, the response rate was 67% (n=47). Results were combined into 3 categories: “agreement”, “disagreement” or “undecided”. Survey questions with the most agreement included: 1) refresher courses on using CM would be helpful (76.6%), 2) switching out the defibrillator to the arrest cart with CM took too much time (74.5%), 3) there was not enough space to accommodate both defibrillators in the room (63.8%), and 4) reminders on the arrest carts would be useful (53.8%). The most common theme in the comments was that switching out the defibrillator took too long.

Discussion: The use of CM during arrests at our institution is suboptimal. Currently, only ICU defibrillators have CM and need to be switched with floor defibrillators for every arrest outside of the ICU. RTs are responsible for connecting the CM and when surveyed, agreed that switching out the defibrillator took too long (74.5%) and there was
not enough space in the patient room to accommodate both defibrillators (63.8%). A process map was created to show how CM is currently used during arrests at our institution (Fig 1). Based on the results of the survey, and as depicted by the process map, increasing CM availability will improve space in the room and eliminate the need to switch out defibrillators. This should increase CM use at the time of an arrest. Given that 76.6% of respondents agreed a refresher course would be helpful, an audit and feedback educational session will be provided to the RTs. The effectiveness of these interventions will be monitored in real time using defibrillator data to assess CM use.

References:


82777 - MECHANICAL STRENGTH AND STIFFNESS OF SINGLE USE LARYNGOSCOPE BLADES

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Introduction: Disposable laryngoscope blades have been introduced for concerns over infectious risks and convenience, vis-a-vis lack of cleaning requirements. Various clinical, cadaver and manikin studies have reported forces ranging from 20 to 39 newtons\(^1\)\(^-\)\(^3\) during direct laryngoscopy. The most recent ISO standard specifies that the laryngoscope blade tip must deflect less than 10 mm with an applied load of 65 N and blades must be structurally intact after an applied load of 150 N\(^4\). There are no studies evaluating adult disposable laryngoscope blades in comparison to the ISO standard. The purpose of this study was to assess the mechanical properties of metal and plastic adult single-use laryngoscope blades in comparison to the ISO standard.

Methods: Nine different models of single-use Macintosh laryngoscope blades were tested (5 metal and 4 plastic). Each blade was attached to a "green standard" metal laryngoscope handle (Heine) which was rigidly clamped to an engineering materials testing machine. Five samples were tested for each type of blade. The testing machine deflected the tip of the laryngoscope blade at a constant rate of 25 mm/min and the resultant force (N) and displacement data (mm) were recorded using a data acquisition computer. Each blade was loaded until structural failure or to a maximum load of 200 N. Custom written LabVIEW software was used to analyze the raw data for deflection at prescribed loads, slope of the load-displacement curves and ultimate failure load. The primary outcome measures were blade deflection at 65 N and ultimate failure load. Secondary outcomes were blade stiffness (N/mm) and mode/location of blade failure. Deflection and load data were expressed as mean ± 1 standard deviation, and analyzed using ANOVA with Holm-Sidak multiple pairwise comparisons.

Results: The blade deflections at a load of 65 N ranged from 5.3 ± 0.3 to 9.5 ± 1.6 mm for metal constructs versus 15.1 ± 0.4 to 19.9 ± 0.8 mm for the plastic designs (p < 0.001 for all metal vs. plastic blades). The ultimate failure loads ranged from 146.1 ± 4.8 to 200 N for the metal blades and 116.8 ± 0.5 to 163.6 ± 0.7 N for the plastic blades (p < 0.005 for all metal vs. plastic blades). A common mode of blade failure was gross deformation or fracture at the handle-blade connection.

Discussion: All of the metal blades and none of the plastic blades met the deflection
criteria (< 10 mm) set by the ISO. All but one of the metal blades withstood the ISO recommended failure load of 150 N, whereas only one of the plastic blades withstood this level of loading. The metal blades were significantly stiffer and stronger than the plastic designs, which may be important in the selection of disposable devices for clinical use.

References:

Summary: Fibrinolysis is an integral part of hemostasis, which under normal conditions is carefully balanced by pro- and anti-fibrinolytic factors. However, this delicate balance is often disturbed in liver disease and during liver transplantation. Hyperfibrinolysis has been identified as one of the causes for microvascular bleeding during liver transplantation (LT). The incidence of hyperfibrinolysis in LT ranges from 9 – 75%. The objective of this study was to determine the incidence of excess hyperfibrinolysis as measured by rotational thromboelastometry (Rotem®) during the 3 phase of liver transplantation: paleo-, an- and neohepatic phases.

Method: With research ethics board approval we retrospectively reviewed the data of 29 consecutive live transplants conducted between Jan and Nov. 2014. Data reviewed included patient variables (etiology of liver failure, age, sex, height, weight, comorbidities), preoperative laboratory data (complete blood count, electrolytes, creatinine, internal normalized ratio (INR), fibrinogen concentration), Rotem® data variables: EXTEM values CT (Clotting time), CFT (Clot Formation Time), MCF (Maximum Clot Firmness), time of onset of initial lysis, CLI (Clot Lysis Index), ML (Maximum Lysis), and surgical data (duration of surgery, cold ischemia time and warm ischemia time). Hyperfibrinolysis was be defined as ML >15% on EXTEM associated with microvascular bleeding as reported by the surgical team. Tranexamic acid was not used unless there was the evidence of hyperfibrinolysis.

Results: Of the 29 patients, 25 (86.2%) has results for Rotem® on blood drawn during the 3 phase of liver transplantation. Fibrinolysis occurred in 15 of 25 patients (60%) during surgery. None of the patients developed fibrinolysis in a preanhepatic phase. The incidence of hyperfibrinolysis varied between the 3 phase of liver transplantation. In an anhepatic phase fibrinolysis was observed in more than 50% patients. Significant number of patients with diagnosis of alcoholic liver cirrhosis 7 of 9 (77.7%) developed primary fibrinolysis.

Conclusion: Hyperfibrinolysis is a common phenomenon during liver transplantation as determined by rotational tromboelastometry occurring most often during anhepatic phase. Rotem® may be guide to effectively manage the use of antifibrinolytics during liver transplantation.
References:

1. Anasth Analg 2014 Sept;119 (3) :553-42
86032 - COMPARISON OF THREE METHODS TO PREPARE ZEUS ANESTHESIA MACHINE FOR MHS

Author(s)
Victor M. Neira
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Primary Author / Presenting Author

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Kevin Nolan - Ottawa Hospital

Introduction: To compare three methods of preparation Zeus Drager anesthesia workstation (ZDAnesWS) for malignant hyperthermia susceptible (MHS) patients and perform a cost-effectiveness analysis.

Methods: Ethics Board review was waived for this machine study. Three ZDAnesWSs were used to study the washout profile of the volatile anesthetics (VA) (sevoflurane, isoflurane and desflurane). Each ZDAnesWS was primed with 1.2 MAC for 2 h using fresh gas flow (FGF) of 2 Lpm, adult circuits and ventilatory parameters. VA concentration ([VA]) washout profiles were studied in three groups. G1: change disposables (breathing circuit, soda lime, CO₂ line and water traps) and washout with a FGF of 10 Lpm to reach a [VA] < 5 ppm for 20 min, then FGF was decreased to 3 Lpm for another 20 min to measure peak rebound [VA]. G2: Same as G1 plus replacing the breathing system (BS) with an autoclaved one. G3: Same as G1 but adding two activated charcoal filters (ACF) on the breathing circuit.

Outcomes: 1. Time to obtain [VA] < 5ppm in each group. 2. Peak rebound [VA] after decreasing FGF to 3 Lpm. 3. In G3, peak rebound [VA] after removal of ACF after 90 min. 4. Cost Analyses: Institutional OR per minute and sterilization costs was estimated in U$ 22.00 and U$60.00 respectively. Retailer prices for the ZD (U$100,000.00) and BS (U$7,500.00) were depreciated in 7 and 1 years respectively, assuming one MHS case per week. Estimated cost of preparation for one MHS was performed for each group.

Results: Time to [VA] < 5ppm was longest in G1 for all VA (>80 min), followed by G2 (>10 min) and the lowest was G3 (< 1 min) (ANOVA p=0.000) (Fig 1). Rebound effect after decreasing FGF to 3 Lpm with [VA] > 5ppm was found in G1 and G2 (p=0.000). Group 3 demonstrated rebound effect after removing the ACF with [VA] > 10 ppm (p=0.000). There were no significant differences for the time to [VA] < 5ppm or peak rebound [VA] between VA within each group. The cost analysis considered MHAUS recommended options. Cost analysis estimate per group are: G1 U$ 3,148.00, spare ZDAnesWS U$ 1,003.00; G2 U$ 1,042.23 and G3 U$ 389.00.
Conclusions: ZDAnesWs preparation for MHS requires a prolonged washout time. Preparation time seem to be the most important factor in the preparation cost. Charcoal filters seem to be the most cost effective and safe alternative to prepare ZDAnesWs for MHS patients. In order to assure that > 95% of ZD are “VA free” the longest mean washout time per group plus 2 SD should be considered. Sterile BS may require up to 25 min washout time, and only changing disposables 130 min with FGF 10 Lpm washout and during the case.

References:

3. Anesthesiology. 2011; 114 (1): 205-
86143 - USE OF BED-SIDE ULTRASONOGRAPHY TO DIAGNOSE IATROGENIC PNEUMOTHORAX

Author(s)
Timothy van Haaften
Toronto General Hospital, UHN
Primary Author / Presenting Author

Co-Authors(s)
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Adriaan Van Rensburg - Toronto General Hospital, UHN

Introduction: Point of care ultrasound is becoming more common place in the critical care and peri-operative setting. Ultrasound can now be used for the rapid diagnoses of numerous evolving clinical phenomena like pneumothorax. Ultrasound is an attractive modality due to its relative portability, speed of acquisition, and real-time imaging. This report describes the utilization of ultrasound to diagnose an iatrogenic pneumothorax intraoperatively following the placement of a central venous catheter.

Clinical features: Following patient consent we report on a 52 year old female who presented for a choledochectomy and biliary reconstruction following a 3 month history of obstructive jaundice associated with significant weight loss. Following the induction of general anesthesia, a central venous catheter (CVC) was sited in her right internal jugular vein. Shortly following the placement of the CVC, there was a decrease in oxygen saturation, and diminished breath sounds over the right hemithorax. While waiting for an intraoperative chest x-ray (CXR), point of care ultrasound demonstrated an absence of lung sliding. From this information a diagnosis of pneumothorax was made. This was subsequently confirmed by the CXR. The surgical team inserted a chest tube and there was immediate improvement in oxygenation. Surgery was completed without any further respiratory events.

Conclusion: Current literature demonstrates that lung ultrasound is more accurate than CXR in ruling out pneumothorax. This report highlights the utility of perioperative point of care ultrasound in the rapid assessment and diagnosis of pneumothorax in a rapidly evolving clinical scenario.
INTRODUCTION: Urethral catheterization in pediatric patients is not without complications. Urethral injury can occur during difficult catheterization, for example, patients with pre-existing urethral stricture, prominent utricle or contracted external urinary sphincters [ii]. Inflation of the balloon in the urethra can also cause urethral trauma, which happened to the newborn patient presented here. We report our intraoperative real-time ultrasonographic evaluation of the placement of the urinary catheter in his urethra (sonourethrography).

Case: A two-day old male patient with imperforated anus was brought to operating room for creation of colostomy. After induction of anesthesia and securing the airway, urinary catheterization was tried with a 6 French Foley’s catheter, which turned out to be unsuccessful and there was some fresh blood at the urethral meatus. Bedside ultrasound imaging was sought to look for any possible urinary trauma.

The ultrasonographic examination of the penis was performed with the patient in the supine position with the penis supported with towels between the thighs. A SonoSite M-Turbo (SonoSite Inc., Bothell, Washington, USA) machine was used with a SLAx 13-6 MHz hockey-stick transducer in the longitudinal (Fig 1A) and transverse (Fig 1B) planes. A sufficient amount of sonographic acoustic gel was applied without excessive compression on the probe. The Foley’s catheter balloon could easily be seen inflated in the anterior urethra and apparently not the in the bladder. It was lying ventral to the urethra and corpus cavernosum (Fig 1A). The catheter was then deflated and withdrawn gently. The patient was then scheduled for confirmatory imaging studies.

Discussion: Urethral trauma due to urinary catheter placement is a relatively uncommon condition with an incidence of up to 3.2 in 1000 in adult male patient[iii]. The incidence in pediatric male patients is not widely reported. This complication is preventable by appropriate training as well as by confirming the catheter placement in the bladder prior to inflation[iii].

Ultrasound techniques have been shown as a valuable asset at the point of care in diagnostic and therapeutic interventions. To the knowledge of authors, however, the ultrasound confirmation of placement of the urinary catheters in pediatric patients has not been reported.
Various imaging techniques are used to diagnose the type, location and extent of the penile injuries such as cavernosography and retrograde urethrogram. They are, however, invasive techniques mainly used to detect urethral traumas, not to confirm the placement of the urinary catheter. Magnetic resonance imaging with its excellent tissue contrast is not considered a routine part of the evaluation of penile trauma.

**Conclusion:** Sonourethrography is a point-of-care, minimally demanding imaging modality with a high quality to confirm placement of urinary catheters in the pediatric patients.

**References:**


GENETICS/GENOMICS POSTER DISPLAY
Saturday, June 20
12:00 PM - 1:00 PM

82771 - COMPOUND RYR1 HETEROZYGOSITY AND MALIGNANT HYPERTHERMIA
Presenting Author: Sheila Riazi, University Health Network, Toronto, Ontario
Co-Authors(s): Natalia Kraeva, Heinz Jungbluth, Nicol Voermans, Erik-Jan Kamsteeg, Jonathan Baets, Chantal Cauterick-deGroote, Luc Heytens
Malignant hyperthermia (MH) is a potentially fatal pharmacogenetic myopathy triggered by exposure to volatile anesthetics and/or depolarizing muscle relaxants. Susceptibility to MH is primarily associated with dominant mutations in the ryanodine receptor type 1 gene (RYR1).\(^1\) Recent genetic studies showed that RYR1 variants are the most common cause of dominant and recessive congenital myopathies - central core and multi-minicore disease, congenital fiber type disproportion, and centronuclear myopathy.\(^2-4\) However, the MH status of many patients, especially with recessive RYR1-related myopathies, remains uncertain. We report the occurrence of a triplet of RYR1 variants, c.4711A>G (p.Ile1571Val), c.10097G>A (p.Arg3366His), c.11798A>G (p.Tyr3933Cys), found in cis in four unrelated families. Phenotype-genotype correlation analysis indicates that the presence of the triplet allele alone confers susceptibility to MH, and that the presence of this allele in a compound heterozygous state with the MH-associated RYR1 variant c.14545G>A (p.Val4849Ile) results in the MHS phenotype and a congenital myopathy with cores and rods. Our study underlines the notion that assigning pathogenicity to individual RYR1 variants or combination of variants, and counseling in RYR1-related myopathies may require integration of clinical, histopathological, in vitro contracture testing, MRI and genetic findings.

References:


23: 195-205.

HEALTH MANAGEMENT POSTER
Sunday, June 21
11:30 AM - 12:30 PM

81676 - A SURGICAL WASTE AUDIT OF LAPAROSCOPIC CHOLECYSTECTOMIES
Primary Author / Presenting Author: Ainsley L. Decker, Memorial University, St. John’s, New Foundland
Co-Authors(s): Tiffany Aylward, Jeremy Pridham, Michael Bautista

83755 - QUALITY IMPROVEMENT OF AN EVIDENCE-BASED PREOPERATIVE CLINIC
Primary Author / Presenting Author: Aaron Mocon, North York General Hospital, North York, Ontario
Co-Authors(s): Richard Bowry, Lloyd Smith, Linda Jussaume

85931 - AUDIT OF PAIN MANAGEMENT WITH THE IMPLEMENTATION OF AN ERAS PROGRAM
Primary Author / Presenting Author: Kelly V. Mayson, Vancouver Acute Hospital, Department of Anesthesia and Perioperative Care, UBC, Vancouver, British Columbia
Co-Authors(s): Liam Stobart, Alana Flexman
81676 - A SURGICAL WASTE AUDIT OF LAPAROSCOPIC CHOLECYSTECTOMIES

Author(s)
Ainsley L. Decker
Memorial University
Primary Author / Presenting Author

Co-Authors(s)
Tiffany Aylward - Memorial University
Jeremy Pridham - Memorial University
Michael Bautista - Memorial University

Background: Over the past three decades, health care waste has increased significantly owing to the fear of spreading blood-borne illnesses. Although operating rooms occupy a small area within a hospital, they produce an estimated 20-30% of a hospital's total waste. The impact of medical waste remains a largely unrecognized source of environmentally damaging material that threatens the sustainability of both our health care system, and the planet. This study's objective was to quantify the amount of potentially recyclable waste associated with laparoscopic cholecystectomies at a tertiary care hospital through a surgical waste audit.

Methods: The Local Ethics Committee determined that ethics approval was not required for the completion of this research project. Twenty laparoscopic cholecystectomies were audited between March and May 2014. All surgical waste was categorized into six streams: recyclable waste, biohazard waste, sharps, blue sterile wrap, linens and normal solid waste (consisting of items that did not meet the definition of the previous 5 categories). The volume and weight of each stream was quantified. The province's Health Information Centre provided data on the number of laparoscopic cholecystectomies performed in the province during one fiscal year. Using this information, we estimated the annual weight and volume of waste produced by all laparoscopic cholecystectomies in the province.

Results: The average total waste (excluding linens) per laparoscopic cholecystectomy was 6.56 ± 0.30 kg, of which 4.23 ± 0.16 kg (64.5%) was normal solid waste, 0.97 ± 0.23 kg (14.8%) was biohazard waste, 0.55 ± 0.05 kg (8.3%) was blue sterile wrap, 0.51 ± 0.14 kg (7.7%) was recyclable waste and 0.31 ± 0.08 kg (4.7%) was sharps. By extrapolation, we estimated that the 1511 laparoscopic cholecystectomies performed in the province in 2012-2013 contributed 7993 kg by weight, roughly the weight of an adult male orca whale, and 317 m³ by volume, roughly the volume of 3.5 adult blue whales, to landfills. Anesthesia waste accounted for approximately 16% of the total surgical waste. Recyclable anesthesia waste accounted for 2.8% of the total anesthesia waste, which represented only 0.5% of the total surgical waste.

Conclusion: While laparoscopic cholecystectomies produce considerable amounts of waste, they are not the leading waste generating surgeries. The preliminary data obtained from this waste audit indicate that better waste management strategies in the operating room could reduce the amount of waste ending up in landfills. Future
directions include investigations into the cost effectiveness and environmental impact of a waste reduction and recycling program in the operating room.

References:
CMAJ 2012 184 (17):1905-1911
Anaesth Intensive Care 2009 37:820-823
WHO 2009 1-28
J Morphol 2006 267: 1284-1294
83755 - QUALITY IMPROVEMENT OF AN EVIDENCE-BASED PREOPERATIVE CLINIC

Author(s)
Aaron Mocon
North York General Hospital
Primary Author / Presenting Author

Co-Authors(s)
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Lloyd Smith - North York Genera Hospital
Linda Jussaume - North York General Hospital

Introduction: DEFINE
As perioperative physicians, anesthesiologist should strive to provide high quality care that, in our current system of limited resources and increased demands, is managed responsibly. To help achieve this, a quality improvement (QI) initiative was undertaken to reorganize a high volume preoperative assessment clinic (PAC) at a community academic hospital. The goal is a PAC that efficiently optimizes patients for surgery using medically- and fiscally-responsible best-practice guidelines for care while minimizing day of surgery (DOS) cancellations. With increased health care system strain, supporting Government initiatives including Ontario's Quality-Based Procedures\(^1\) and the Canadian Medical Association's Choosing Wisely Campaign\(^2\) is a priority. An overarching principle is to foster a patient- and family-centred environment.

Methods: MEASURE
The project was REB approved. Stakeholder meetings involved anesthesiologist, surgeons, internists, nurses, allied health, management, QI specialists and patients. Using a Lean Six-Sigma QI approach, a preoperative process map was examined from initial surgical consultation until DOS. After streamlining improvement cycles, several key concerns included: the lack of completeness of charts, PAC booking barriers, PAC no-shows, long duration of PAC appointments and medically unnecessary investigations/consultations (perhaps ordered as ‘operation cancellation insurance’).

Results: ANALYSE
Current state metrics include number of patients seen, type of consult done (anesthesia, medicine, nursing), no-shows, incomplete charts, duration of appointment and type and cost of investigations.

IMPROVE
Using best-practice recommendations from current perioperative literature\(^3\-^6\) and major societal practice guidelines\(^7\,8\), routine preoperative investigation orders (laboratory, chest X-ray and electrocardiogram) were updated. Guidelines, based on patient and surgical criteria, were created to help guide surgeons whether patients require preoperative consultation by anesthesiology and/or internal medicine, if at all. A perioperative package was updated to facilitate communication between hospital and
surgeon’s offices to improve the completeness of charts and avoid delays. To help create a patient- and family-centred experience, patient pamphlets were updated with clear instructions and a reduction of unnecessary visits/investigations will ultimately result in shorter PAC appointments.

CONTROL
Pre and post-restructuring metrics will be compared as outcome measures. Control measures including DOS rates of: cancellation, unanticipated admission, medicine consultations and recovery room length of stay will be recorded to assess for negative patient outcomes. Cost analysis of investigations will assess for potential system resource savings. Finally, qualitative patient surveys will be conducted.

Discussion: The restructuring of a PAC is described. A QI approach is being used to create an efficient, patient- and family-centred environment that minimizes unnecessary investigations/consultations while maintaining a high standard of care that is consistent with current perioperative literature.

References:


2- http://www.choosingwiselycanada.org


Optimization of pain management using multimodal therapy is a key component of an Enhanced Recovery After Surgery Program (ERAS). Multimodal analgesia has been defined as the use of more than one modality of pain control to achieve effective analgesia while reducing opioids-related side effects. We defined the use of multimodal analgesia therapy, as the use of peri-operative acetaminophen and administering either a thoracic epidural, an Intraoperative Lidocaine infusion, or Transverse abdominal block, in elective colorectal surgery cases.

**Method:** After obtaining local ethics approval, the charts of 174 elective colorectal procedures performed between November 2013 and August 2014 were reviewed. The type of analgesia methods, analgesics requirements intraoperatively, in PACU, and postoperatively were determined. Morphine was converted to hydromorphone equivalents when used. Postoperative complications and length of stay were assessed. We compared our complication rates with our pre-existing American College of Surgeons National Surgical Quality Improvement Program NSQIP database prior to implementation of our ERAS program (July 2011-June 2013), and following implementation (November 2013-August 2014). Complication rates were compared using chi-square, Fisher’s Exact and student t-tests as appropriate.

**Results:** Multi-modal analgesia was used in 76.2% of all procedures (81.4% of open cases versus 64.5% of MIS cases). 18.4% of cases received three different pain management modalities and 5.2% had > 4 modalities and this varied by type of procedure (Table 1).

<table>
<thead>
<tr>
<th>Opioid-Sparing Technique Utilized</th>
<th>Open Procedure N=56 cases</th>
<th>MIS Procedures N=108 case</th>
<th>MIS converted to Open Procedures N=10</th>
<th>Total N=174</th>
</tr>
</thead>
</table>

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The use of an intraoperative lidocaine infusion was associated with a significant decrease in rescue analgesia requirements in the recovery room. The average requirements of fentanyl and hydromorphone in the lidocaine group were significantly lower; Fentanyl mean (standard deviation (SD)) 24.2 (59) versus 81.4 (78) ug (P < 0.05), and hydromorphone mean (SD) 0.76(1.3) versus 1.46 (1.4) mg (p < 0.05).

Lidocaine infusions were also associated with a reduced incidence of excessive pain in PACU, 4.25% vs. 18.4% (p < 0.05).

Following implementation of our ERAS program, morbidity incidence fell from 31% to 21%.. Median length of stay was reduced from 9 to 7 days.

**Conclusion:** Although the majority of our patients are receiving multimodal analgesia,
as part of our ERAS program, pain management could be further improved. Lidocaine infusions are effective in reducing opioid requirements as previously shown\textsuperscript{2}, and appear to be under utilized in those patients not receiving thoracic epidurals. Implementation of our local ERAS program has resulted in a reductions in complication rates and hospital length of stay.

References:

1) Kehlet H, Dahl JB. The value of "multimodal" or "balanced analgesia" in postoperative pain management. Anesth Analg 1993;77:1048-56

NEUROANESTHESIA POSTER DISPLAY
Saturday, June 20
12:00 PM - 1:00 PM

79873 - AWAKE CRANIOTOMY USING SPEECH ASSESSMENT FOR OPTIMAL TUMOR RESECTION
Primary Author / Presenting Author: Catriona J. Kelly, Department of Anaesthesia, St Michael's Hospital, University of Toronto, Toronto, Ontario
Co-Authors(s): Shannon Milburn, Melanie Morrison, Simon Graham, Forough Kalani, Gregory Hare, Andrea Rigamonti, Sunit Das, Marco Garavaglia

84365 - MAJOR SPINE SURGERY IN PATIENTS WHO REFUSE BLOOD PRODUCT TRANSFUSION
Primary Author / Presenting Author: Alexandra Kisilevsky, University of British Columbia, Vancouver, British Columbia
Co-Authors(s): Alana Flexman, Liam Stobart, Kristine Roland

84810 - DEPTH OF ANESTHESIA MONITORING IN PATIENTS WITH NEUROLOGICAL DISEASE
Primary Author: Lakshmikumar Venkat Raghavan, Toronto Western Hospital, University of Toronto, Toronto, Ontario
Presenting Author: Jigesh Mehta, Toronto Western Hospital, Toronto, Ontario
Co-Authors(s): Suparna Bharadwaj, Mahesh Nagappa, Audrey Tan

86013 - INCIDENCE OF PONV FOLLOWING ENDOSCOPIC ENDONASAL SKULL BASE SURGERY
Primary Author / Presenting Author: Christopher Dyte, University of Calgary, Department of Anesthesia, Calgary, Alberta
Co-Authors(s): Melinda Davis, Candace Baranieski

86018 - EFFECT OF DESFLURANE ON MEP MONITORING: HEMIFACIAL SPASM VS CONTROL
Presenting Author: Tumul Chowdhury, Department of Anesthesiology and Perioperative Medicine, University of Manitoba, Winnipeg, Manitoba
Primary Author: Marshall Wilkinson, Section of Neurosurgery, University of Manitoba, Winnipeg, Manitoba
Co-Authors(s): W. Alan Mutch, Anthony Kaufmann
86026 - CARDIOVASCULAR PERTURBATIONS IN DBS SURGERY - A DETAILED ANALYSIS
Primary Author / Presenting Author: Tumul Chowdhury, Department of Anesthesiology and Perioperative Medicine, University of Manitoba, Winnipeg, Manitoba
Co-Authors(s): Ronald Cappellani, Marshall Wilkinson

86033 - THE ROLE OF ANESTHESIA SIMULATION IN I-MRI GUIDED NEUROSURGERY
Primary Author / Presenting Author: Tumul Chowdhury, Department of Anesthesiology and Perioperative Medicine, University of Manitoba, Winnipeg, Manitoba
Co-Authors(s): Sergio Bergese, Suren Soghomonyan, Ronald Cappellani
79873 - AWAKE CRANIOTOMY USING SPEECH ASSESSMENT FOR OPTIMAL TUMOR RESECTION

Author(s)
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Marco Garavaglia - University of Toronto

Introduction: Since its early development by Dr. Penfield, the goal of awake craniotomy is to achieve optimal tumor excision while preserving eloquent brain regions. The evolution of our understanding of speech mechanisms has allowed for the application of increasingly sophisticated methods of assessing high-level speech function intra-operatively. We utilized an anesthetic approach needless of any airway manipulation1, thereby optimizing brain mapping conditions and real-time continuous speech assessment during brain tumor resection. We present three cases of repeat craniotomies with an awake approach and we compare this experience with their prior asleep craniotomy, assessing the value of continuous intraoperative speech assessment.

After REB approval and obtaining informed consent, case-reviews were performed for three patients who had undergone awake redo-craniotomy. The standardized anesthetic protocol was based on scalp block and dexmedetomidine infusion as the primary anesthetic agent. 1

A multidisciplinary team included anesthesia, surgery, medical imaging, nursing and Speech and Language Pathologist (SLP). The SLP completed a preoperative assessment and performed ongoing assessment during tumor resection. Post-operatively, a telephone interview was conducted with the patients following their awake craniotomy. The Wessex Neurological Questionnaire (WNQ) was used and modified to allow for comparison between the procedure performed under general anaesthetic and that performed awake.2

Results: All three patients had successful excision of the tumor. In each case, SLP provided a systematic evaluation of speech and language function and the surgical team identified that real-time speech assessment directed the surgical plan promoting an optimal tumor excision and preservation of eloquent areas. All patients felt both anesthetic experiences were positive. Results from the WNQ are presented in Table 1.
**Discussion:** Patient’s assessment, preparation and an integrated team-expertise are crucial to the success of an awake craniotomy. The support of SLP allows minimizing postoperative neurological sequelae providing an ongoing assessment during surgery. The preoperative evaluation is the opportunity for the SLP to connect with the patient, engaging in topics that can be used for conversation during surgery.

Interestingly, in these cases the patients were kept awake during tumor resection and the SLP continued conversation with them. One patient had speech arrest during resection of what was mapped to be a safe area and one patient had a seizure. These deficits may not have been detected if the patients had been sedated after brain mapping or if utilizing an anesthetic technique with instrumented airway (e.g. asleep-awake-asleep).

It’s also important for the healthcare team to understand the patients' complex and subjective experience to improve delivery of care. There is limited literature published relating to the comparative anesthetic experience of patients who underwent asleep vs. awake craniotomy.³ Our findings show patients had a positive experience for both types of surgery. However the awake procedure had a shorter length of stay.

**References:**

2. Cancer Nursing 31;2 2008: 166-172
84365 - MAJOR SPINE SURGERY IN PATIENTS WHO REFUSE BLOOD PRODUCT TRANSFUSION

Author(s)
Alexandra Kisilevsky
University of British Columbia
Primary Author / Presenting Author

Co-Authors(s)
Alana Flexman - University of British Columbia
Liam Stobart - University of British Columbia
Kristine Roland - University of British Columbia

Introduction: Patients undergoing major spinal surgery are at increased risk of intra-operative bleeding [1]. The management of patients who refuse allogeneic blood transfusion and undergo complex spine surgery is challenging yet little evidence exists to guide the peri-operative management of this population [2,3]. This study compared blood conservation strategies and outcomes between complex spinal surgery patients who declined (versus those who accepted) blood product transfusion.

Methods: With institutional REB approval and a waiver for informed consent, we used our institutional Blood Utilization Program database to identify patients who underwent major surgery for degenerative spine disease and who refused blood product transfusion between June 1, 2004 and May 31, 2014. Patients who refused blood transfusion were randomly matched to control patients (who accepted blood transfusion) based on age, sex, year of surgery, baseline hemoglobin and surgical location (cervical vs thoracolumbar). A detailed retrospective chart review was completed. Peri-operative blood conservation strategies and post-operative outcomes were compared between the two groups.

Results: Seven patients who refused blood transfusion underwent major spinal surgery for deformity or degenerative correction over the study period and were matched to 27 control patients. Patients who refused blood product transfusion received a greater number of blood conservation interventions than those who accepted transfusion (median (range) 5 (3-7) versus 3 (0-6), p < 0.005). The peri-operative hemoglobin nadir was similar between the two groups (mean (standard deviation) 101 (20) versus 94 (15) g/L, p=0.27 in the refusal and control groups, respectively). Hospital length of stay was also similar and there were no deaths identified in either group. No major adverse events were documented for any patient who refused blood product transfusion.

Conclusion: Our study results describe a cohort of patients who declined blood product transfusion yet successfully underwent major spinal surgery with similar outcomes compared to patients who accepted transfusion. Patients who refused blood transfusion received more aggressive peri-operative blood conservation measures to minimize the risk of severe anemia.
References:
1. Eur Spine J 2004 13 Suppl 1: S3-5
2. Spine 2008 33: 2310-2315
Introduction: Use of Depth of Anesthesia (DOA) monitors has been shown to reduce the anesthetic use and to maintain perioperative hemodynamics. Patients with neurological disorders such as Parkinson’s disease are prone for perioperative hemodynamic instability due to preexisting autonomic dysfunction and hence benefit from the use of DOA monitors. Commonly used DOA monitors like Bispectral index (BIS) and entropy are calibrated and validated in healthy subjects with normal cerebral function. The aim of this study was to determine how BIS and entropy perform in relation to the current clinical indices of DOA in patients with neurological conditions.

Materials and Methods: After IRB approval and patient consent we conducted a prospective non-randomized, observational study in patients with neurological disorders undergoing internalization of deep brain stimulators (DBS). All patients received standard general anesthetics with endotracheal intubation and sevoflurane maintenance. Age adjusted MAC (aaMAC) of inhalational anesthetic was maintained between 0.7-1.1 to ensure adequate depth of anesthesia. BIS and entropy sensors were applied on left forehead in all patients prior to induction. BIS, response entropy (RE), state entropy (SE), heart rate (HR) and mean arterial pressure (MAP) and aaMAC at various points from induction to post extubation were collected and analyzed and correlated. RE divergence of more than 10 points from SE is considered as inadequate patient analgesia.

Results: Thirty patients were recruited in this study (mean age was 58.4±11, Male: Female 18:12 and weight 79.2±17). Indication for DBS were Parkinson’s disease (PD) (n=23), essential tremors(2), alzheimer’s disease (2), Dystonia (2) and depression( 1). We found that the trends in BIS, entropy, aaMAC and hemodynamic (HR and MAP) values followed closely during different intraoperative time points except during tunneling. There was a very strong positive correlation between BIS and RE (r=0.870) and BIS and SE (r=0.903), strong positive correlation between aaMAC vs BIS, RE, SE, r=0.476, 0.628, 0.544 respectively. There was no correlation between RE and HR r=
0.039, RE and MAP 0.167, SE and HR 0.042, SE and MAP 0.147, BIS and HR 0.036, BIS and MAP 0.147. RE divergence from SE were less than 10 throughout indicating optimal patient analgesia.

**Discussion:** Our study showed that BIS and entropy perform reliably in patients with Parkinson’s disease and other neurological disorders. There was a good correlation between BIS and entropy devices. However, HR and MAP are not reliable indicators of depth of anesthesia in this subset of patients probably due to preexisting autonomic dysfunction. Hence BIS and entropy are dependable non-invasive tools to target the administration of anesthetics in these patients. Monitoring of divergence of RE from SE will enable careful titration of opioid analgesics. This helps in preventing chest rigidity, constipation, nausea and vomiting due to excessive opioids.

**References:**


Introduction: Endoscopic surgery is quickly being adopted for multiple surgical interventions, including endoscopic endonasal surgery as an approach to a variety of tumors including functional and nonfunctional pituitary tumors and meningiomas. There are multiple factors known to contribute to postoperative nausea and vomiting (PONV), one of which includes surgical type (1). Endoscopic sinus surgery has been reported to have high rates of PONV, ranging from 40-68% (2), and intracranial procedures reaching rates greater than 40% (3), but PONV in endoscopic skull base surgeries (which combines endoscopic sinus surgery and intracranial surgery) has not been established, nor if any particular antiemetic prophylaxis or therapy is more effective in this specific patient population.

Methods: Following REB approval, a retrospective chart review was completed encompassing all cases of endoscopic endonasal skull base surgery performed at our centre since the procedure’s inception through August 31, 2013. Data obtained included demographics, PONV risk factors, indication for surgery, CSF leak, NPO duration, duration of anesthesia, anesthetic technique, neostigmine use, intraoperative chemoprophylaxis, intraoperative and postoperative opioid doses, presence of PONV and time to discharge from PACU. Data was then analyzed with unpaired Student t-tests, Fisher’s Exact Testing and Binomial Logistic Regression.

Results: A total of 202 cases were reviewed, with 40.1% of patients having PONV. There was no increase of PONV incidence with age (p=0.83), BMI (p=0.36), ASA > 2 (p=0.75), smoking history (p=0.11), NPO duration (p=0.91) or anesthetic duration (p=0.44). Time in the post anesthetic care unit (PACU) was increased from 1.98±0.23 hours to 3.54±0.85 hours (p=0.001) when PONV occurred. With binomial logistic regression analysis (Table 1), further significant variables included non-urgent ASA status (p=0.014), antiemetic prophylaxis (p=0.024) and dose of opioid received in PACU (p=0.02). For PONV chemoprophylaxis, steroids were found to be beneficial (p=0.034) with indication that ondansetron may be helpful (p=0.09), though it did not reach statistical significance.

Discussion: PONV contributes to multiple negative effects including electrolyte imbalance, dehydration, increased ICP, hypertension, surgical site compromise and potential airway compromise which can have major morbidity for patients with recent
intracranial surgery (4). Incidence of PONV was found to be 40.1%, within the range previously described for endoscopic sinus surgery. When PONV occurred, a clinical and statistical increase in time spent in the recovery area is noted, which may contribute to additional health care costs and patient discomfort. Analysis of current practices highlights a few elements that may be beneficial in minimizing PONV risk, including use of antiemetic chemoprophylaxis, especially steroids and potentially ondansetron, minimizing post operative opioids and avoidance of nitrous oxide. Improved understanding of the incidence and contributing factors, as well as current practice regarding prophylaxis and management will ultimately allow for improvement in care of this patient population.

References:


Hemifacial spasm (HFS) is a cranial nerve hyperactivity disorder characterized by unique neurophysiological features. Notably facial MEP from HFS patients show characteristics suggestive of elevated facial motor neuron excitability [1-4]. In this study we examine facial motor neuron excitability and compare the effects of desflurane on facial MEP from the spasm and non-spasm side of patients undergoing microvascular decompression (MVD) surgery for HFS.

Methods: 31 patients undergoing MVD for HFS consented to participate in this prospective study. MEP were elicited by transcranial electrical stimulation at C3 and C4 (referenced to Cz) and recorded from the o. oculi (spasm side only), o. oris and mentalis muscles prior to dural opening. Under total intravenous anesthesia (TIVA) and TIVA plus desflurane (0.5 and 1 MAC), MEP activation threshold voltage and mean amplitudes were determined from individual facial muscles as well as pooled data from all muscles on both sides. Mean arterial blood pressure and EEG were recorded at each anesthetic condition.

Results: During TIVA the mean activation threshold for spasm side facial MEP was 162.9 ± 10.1 V compared to 198.3 ± 10.1 V (p = 0.01) on the non-spasm side. Additionally, MEPs were elicited using single pulse transcranial electrical stimulation in 74% of HFS muscles versus 31% of non-spasm facial muscles (p = 0.03). Desflurane (1 MAC) significantly suppressed facial MEP from both the HFS and control sides [Figure 1]. However, the suppressive effects of desflurane were significantly greater on the non-spasm side (79%) versus the spasm side (58.8%). M waves recorded from the mentalis muscle (spasm side) were 1.76 ± 0.2 mV during TIVA and 1.82 ± 0.2 mV with 1 MAC desflurane (p = 0.9) indicating that desflurane was not effecting the neuromuscular junction [5]. Neither blood pressure nor EEG state were significantly different between the 2 anesthetic conditions.

Conclusion: The results of this study suggest that elevated motor neuron excitability is evident on the spasm side of the facial corticobulbar pathway in HFS patients and this
likely explains the differential effects of desflurane on spasm and non-spasm MEP.

References:


Hemodynamic perturbations can be anticipated in deep brain stimulation (DBS) surgery and may be attributed to multiple factors including patient, disease and procedural related characteristics [1-5]. In addition, the effects of other factors such as laterality of implants and same day of battery placement on hemodynamics are still not known. Acute changes in hemodynamics may produce severe complications such as intracranial bleeding, transient ischemic stroke and myocardium infarction [6]. Therefore, this study attempts to determine the incidence of total hemodynamic perturbances (rate) and related risk factors in patients undergoing deep brain stimulation surgery.

**Material and Methods**
After institutional approval, all patients undergoing DBS surgery for the past ten years were recruited for this study. Demographic characteristics including patient’s characteristics, disease and risks factors characteristics, procedural characteristics and intraoperative hemodynamic changes were noted. Event rate (total hemodynamic perturbations in relation to total anesthesia time) was calculated and the effect of all the variables on hemodynamic perturbations (predefined - bradycardia, tachycardia, hypertension, hypotension and ECG changes) was analyzed by regression model. Standard anesthetic technique was used in all patients.

**Results:** Data from 79 procedures were included for the final analysis. Among various characteristics noted, male patients (64.6%), Parkinson disease (50.6%), history of smoking (25.3%), hypertension (33%), bilateral electrode placement (73.4%) and same day battery placement (58.2%) were found to be more common variables in their respective groups [Table 1]. Total hemodynamic adverse events during DBS surgery was 10.8 (0-42) and treated in 57 % of cases. Baseline blood pressure including systolic, diastolic and mean arterial pressure was found to have highly significant effect [14 %, 31 % and 19 % greater chance of adverse hemodynamic event per 10 mm Hg increase in value respectively] on intraoperative hemodynamic perturbations [Table 2]. DBP had the greatest impact among all the hemodynamic parameters. Other variables including type of disease, duration of symptoms, number of medications used, type of nuclei stimulated, laterality of DBS implants and battery placement on the same day had no significant effect on hemodynamic perturbations during DBS surgery (Table 3).
**Conclusion:** This study is the first detailed description of hemodynamic perturbations associated with DBS surgery in relation to all influencing preoperative and intraoperative possible factors. Among all the factors, baseline blood pressure does significantly affect the hemodynamic perturbations and DBP has highest impact on these events.

**References:**

5. Mov Disord. 2012; 27: 988-95
86033 - THE ROLE OF ANESTHESIA SIMULATION IN I-MRI GUIDED NEUROSURGERY

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Introduction: Simulation based practices represent a rapidly evolving field for the perioperative care of patients. [1] The role of simulation in neurosurgical anesthesia is still in its infancy and is mainly limited to management of raised intracranial pressure as well as intraoperative rupture of cerebral aneurysms.

We present 2 cases when pre-procedural simulation was used and highlight the practical value of such an approach when initiating a new i-MRI program. We utilized a simulation technique before commencing the real cases. These simulations assisted us in developing a thorough and clear plan of the perioperative management of the patients prior to starting the actual cases.

Cases: We did two simulation (Fig. 1) using a 3-Tesla 3 Tesla IMRISneuro i-MRI. Two of our nurses agreed [written and informed consent obtained] to volunteer. The first session was performed in supine position and the second session was conducted in prone.

Case 1. A right frontal craniotomy was simulated. In the pre-procedural area, a team of anesthetists, nurses, surgeon and an MRI technician checked the patient for presence of metallic implants or other restricted items. The infusion pumps were placed on the patient’s right side, and the arterial and venous lines were taped to the participant’s left arm to mimic a real case. An endotracheal tube was taped to the patient’s cheek. Hereafter, the surgeon imitated placement of the Mayfield frame (soft blocks), and the patient was properly padded and draped. And after final verification of the procedure checklist, the magnet was moved in and the simulation was uneventfully completed.

Case 2. A case of posterior cranial fossa tumor requiring prone positioning was imitated. While the magnet was in place and the patient in the prone position, we simulated an emergency situation with activation of a Code Blue to determine how much time would be required to remove the magnet, position the patient supine and initiate advanced cardiovascular life support (ACLS). It took 80 seconds to move the
magnet away from the patient’s body so that CPR could be initiated while the patient was still prone. The time required to remove the magnet out of the suite, position the patient supine, attach the defibrillator and deliver the initial shock required almost 2 minutes and 45 seconds. “Restoration of pulse” concluded this unique simulation.

**Discussion:** In our opinion, simulation creates a real perception of the procedure with minute details that are really important for effective case management in the environment of a high magnetic field. We were able to precisely plan the anesthetic, surgical, and radiological strategies in both simulation cases [2-5].

We assessed the feasibility and implications of performing CPR in the i-MRI suite in the presence of a magnetic field. From the second simulation case, we have learnt that it is feasible to apply chest compression within short duration of time (within few seconds) till the magnet is being moved away up to the head of the patient.

**Conclusion:** These simulations assisted us to refine the procedural checklist, develop procedures for urgent situations and develop the skills required for effective management of patients undergoing MRI-guided neurosurgical interventions.

**References:**

OBSTETRIC ANESTHESIA POSTER DISPLAY
Sunday, June 21
11:30 AM - 12:30 PM

76974 - TRAGIC OUTCOME OF A DELAYED PERIMORTEM CESAREAN DELIVERY
Primary Author / Presenting Author: Muhammad Ajmal, Coombe Women and Infants University Hospital, Dublin, Ireland, Dublin, Not applicable, Ireland
Co-Authors(s): Niall Hughes, Michael Carey

82734 - HEMODYNAMIC EFFECTS OF LOW DOSE SPINAL ANESTHESIA IN CESAREAN SECTION
Primary Author / Presenting Author: Marta J. Cenkowski, University of Manitoba, Winnipeg, Manitoba
Co-Authors(s): Doug Maguire, Duane Funk, Fahd Al-Gurashi, Ahmed Bokhari, Regina Legaspi, Stephen Kowalski

84493 - CAESAREAN FOR HEREDITARY NEUROPATHY WITH LIABILITY TO PRESSURE PALSY
Primary Author / Presenting Author: Julia A. Haber, Department of Anesthesia, Foothills Medical Centre, Calgary AB, Calgary, Alberta

84665 - PRESSURE WAVEFORM TO CONFIRM PLACEMENT OF EPIDURAL NEEDLE IN LABOUR
Primary Author / Presenting Author: Ilana Sebbag, University of Western Ontario, Schulich School of Medicine, Department of Anesthesia, LONDON, Ontario
Co-Authors(s): Indu Singh, Fatemah Qasem, Kevin Armstrong

84995 - TIMING OF DEXAMETHASONE FOR POSTOPERATIVE PAIN IN CESAREAN SECTIONS
Primary Author / Presenting Author: Yaryna Bychkivska, University of Manitoba, Winnipeg MB, Winnipeg, Manitoba
Co-Authors(s): Duane Funk

85629 - CARBETOCIN AT ELECTIVE CESAREAN SECTION: 20 MCG VERSUS 100 MCG
Primary Author / Presenting Author: Samar Tabl, Department of Anesthesia and Pain Management, Mount Sinai Hospital, University of Toronto, Toronto, Ontario
Co-Authors(s): Mrinalini Balki, Kristi Downey, Dan Farine, Gareth Seaward, Jose Carvalho

85945 - UNANTICIPATED POST PARTUM RIGHT VENTRICULAR HEART FAILURE
Presenting Author: Vasudha Misra, University of Manitoba-WRHA, Winnipeg, Manitoba
Co-Authors(s): Jagroop Gill

85958 - EFFECT OF PULSATILE OXYTOCIN ON THE DESENSITIZATION OF MYOMETRIUM
Primary Author / Presenting Author: Chiraag Talati, Department of Anesthesia and Pain Management, Mount Sinai Hospital, University of Toronto, Toronto, Ontario
Co-Authors(s): Nivetha Ramachandran, Jose Carvalho, Mrinalini Balki
76974 - TRAGIC OUTCOME OF A DELAYED PERIMORTEM CESAREAN DELIVERY

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Introduction: A systematic review of case reports describing the management of cardiac arrest during pregnancy significantly enhanced our understanding of cardiopulmonary resuscitation (CPR) in pregnant women\(^1\). Cardiopulmonary resuscitation during out-of-hospital cardiac arrest in pregnant women still remains a major challenge for emergency medical technicians (EMTs) responding to a call. Here we describe the circumstances leading to a tragic outcome despite the immediate availability of CPR to a full-term pregnant woman who suffered a witnessed out-of-hospital cardiac arrest.

Case description: A two member team of EMTs attended a full term pregnant women who suddenly collapsed and then suffered from cardiac arrest at her home. She received immediate CPR as she lost her pulse in front of the EMTs, who were present to attend her "collapse". She was transported to the operating room of a hospital in 20-minutes time with CPR in place. A multidisciplinary team took over her further management in the hospital. A perimortem caesarean delivery (PCD) was performed in 10-minutes time. A severely hypoxic but alive foetus was delivered who died few days later. The spontaneous circulation of the woman returned immediately after the delivery. The peripheral arterial oxygen saturation and end-tidal carbon dioxide monitoring indicated adequate cardiac output [Figure Below: Trace of patient’s arterial oxygen saturation (SpO\(_2\)) and end tidal carbon dioxide (ET\(_{CO2}\)) after the return of spontaneous circulation]. Post-cardiac arrest care was instituted but she died 16-hours later.

Discussion: The applications of effective left lateral uterine displacement and incorporating the 4-minute rule to perform PCD during a CPR have saved the lives of many foetuses and mothers in hospital-settings\(^2\). Out-of-hospital cardiac arrest during advanced pregnancy poses special challenges to CPR because the “goldstandard” treatment of early PCD currently is not possible in an out-of-hospital setting and usually a late PCD after arriving a hospital is performed. Our recent insight from a series of out-of-hospital CPR cases revealed that the outcome could be improved by educating the family members and friends of cardiac arrest victims in the techniques of basic life support\(^3\) but even this strategy will not be successful in pregnant women because here success depends upon an early PCD. Aortocaval compression severely restricts cardiac output in pregnant women during CPR\(^4\). Early intravenous fluid administration may be helpful to break this vicious cycle and restore spontaneous circulation. This report emphasis that some new direction is required to deal with the challenge of pre-hospital CPR in full-term pregnant women\(^5,6\).
References:

5. Obstet Gynecol 2010; 203:179 e1-5
82734 - HEMODYNAMIC EFFECTS OF LOW DOSE SPINAL ANESTHESIA IN CESAREAN SECTION

Author(s)
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Stephen Kowalski - University of Manitoba

Introduction: Spinal anesthesia is the most commonly used technique for Cesarean section. The conventional local anesthetic used is hyperbaric bupivacaine (0.75% solution) with or without opioids [1-3]. The conventional dose of local anesthetic has been decreasing over time to between 8 and 12.5mg [4]. Recent published reports have demonstrated adequate anesthesia with even lower doses of bupivacaine (4.5-7mg) [5,6]. These lower doses may be associated with less hypotension, improved cardiac output, lower incidence of nausea and vomiting, and faster recovery from motor and sensory blockade. We hypothesized that low dose spinal anesthesia (4.5 mg) would result in improved maternal cardiac index when compared with conventional dose (9mg) intrathecal bupivacaine while maintaining adequate surgical anesthesia.

Methods: This Randomized Controlled Trial was approved by the local Biomedical Research Ethics Board. Written informed consent was obtained from healthy parturients undergoing elective cesarean section. In addition to standard CAS monitors, an arterial line was placed for continuous monitoring of blood pressure and cardiac index using a minimally invasive cardiac output monitor. Our primary outcome was the difference in cardiac index (CI) between groups from the start of the case to 25-minutes after spinal anesthesia was initiated. Secondary outcomes included mean arterial pressure response, time to discharge from recovery room, fluid administration, vasopressor usage, maternal satisfaction, adequacy of surgical blockade and recovery time from motor and sensory blockade.

Results: Cardiac index decreased significantly in both groups from the start of the case to the 25-minute time period (p < 0.0001, two way repeated measures ANOVA). The decrease in CI however was not significantly different between groups (p=0.36, group vs. time interaction). With respect to mean arterial pressure, there was a positive group vs. time effect with patients in the high dose spinal group having higher mean arterial pressures than the patients in the low dose spinal group (p < 0.001, group vs. time effect). Vasopressor use was similar between groups. The low dose spinal group demonstrated equivalent surgical anesthesia and block onset times compared to the
conventional spinal group. In addition, the low dose group had significantly faster sensory and motor recovery times with a shorter recovery room stay compared to the conventional dose group (70 ± 11 minutes vs. 92 ± 21 minutes, p < 0.01).

**Discussion:** Low dose spinal anesthesia for cesarean section does not result in improved maternal CI when compared with conventional dose. This lack of difference in CI may be related to persistent IVC compression in both groups. Alternatively the venodilating effect of both doses of bupivacaine on the splanchnic vasculature reduces venous return, and therefore CI, to a similar extent. In appropriately selected patients, low dose spinal anesthesia demonstrates equivalent surgical conditions and hemodynamics to conventional spinal anesthesia with the benefit of faster recovery from sensory and motor blockade.

**References:**

Purpose: Hereditary Neuropathy with liability to Pressure Palsies (HNPP) is a rare (7-16/100 000) but likely underdiagnosed genetic predisposition to motor and sensory nerve injury from minimal pressure and stretch (1). There are limited reports in the literature discussing neuraxial anesthesia in obstetrical patients with HNPP (2-5). The purpose of this case report is to highlight the existence of this unusual disorder, to report the use of spinal anesthesia for elective Caesarean delivery in a patient with HNPP, and to discuss principles of management of HNPP perioperatively.

Clinical Features: Patient consent for this case report was obtained. A 31 year old G1P0 presented for elective Caesarean delivery at 38 weeks and 3 days. Pregnancy was unremarkable except for shingles in a thoracic distribution in 3rd trimester, which was treated with antiretrovirals and had resolved prior to delivery. Past medical history was significant for a clinical and electrophysiologic diagnosis of HNPP 6 years prior (presenting with numbness/weakness in the hands, and a foot drop). During pregnancy, the patient experienced numbness in the hips and thighs, but no other signs or symptoms of neuropathy. Despite no obstetrical indication for operative delivery, Caesarean was chosen after anesthetic consultation and discussion with the obstetrician, in an attempt to decrease the time that the patient might be immobile, and to avoid an assisted vaginal delivery. Information from the HNPP website (http://www.hnpp.org/letter.htm) was reviewed by the anesthesia provider.

A spinal anesthetic was performed at L3/4 using a 25G Whitacre needle, with a brief paresthesia to the labial area that resolved almost immediately. Bupivacaine 0.75% 1.5 cc, 10 micrograms of fentanyl and 150 micrograms of morphine were administered. Prior to incision, the block was at T4 (ice) and T6 (pinprick). Careful attention was paid to positioning, with foam pads at the knees and elbows, in the position of "maximal comfort" prior to block onset.

The Caesarean section proceeded uneventfully. The block to ice had receded to T6 2 hours after the spinal injection, and the patient was noted to be ambulating on the ward the evening of surgery. Telephone follow up with the patient several months later revealed that she had developed a unilateral foot drop which resolved slowly over the course of 2 months postpartum. The patient was seen at an urgent care clinic for these symptoms, but did not contact her neurologist or the anesthesia department. She felt strongly that her foot drop was related to pressure from the foam padding at the site of the common peroneal nerve during surgery. At the time of follow-up, the patient had no active neuropathy.
**Conclusions:** Despite best efforts to avoid pressure on peripheral nerves in patients with HNPP, there is still risk of neuropathy in parturients, whether during labour or delivery. Although longer labour and use of forceps may be associated with a higher incidence of neuropathy (2), there is no evidence that elective Caesarean is indicated to avoid nerve damage, and a dense block may mask signs of pressure despite attempts at careful positioning. However, spinal anesthesia is a reasonable choice if Caesarean delivery is required in patients with HNPP.

**References:**
Introduction: Epidural analgesia is highly effective for labor pain relief and is widely chosen by pregnant patients. However, placement of the epidural needle can be challenging in pregnant patients due to lax tissue ligaments and edema so that the traditional loss of resistance method (LOR) used to find the space may be subtle leading to retries which may delay onset of analgesia as well as increase the risk of complications.\textsuperscript{1} The ability to transduce a pulsatile pressure waveform from epidural needles placed in non-labouring patients correlates highly with successful placement of the epidural needle.\textsuperscript{2,3} No studies have been done to date to identify a pulsatile pressure waveform in the obstetric patient population during labour. It is unknown how and if uterine contractions interfere with it. We wish to demonstrate the presence of a pulsatile pressure waveform transduced through the epidural needle in labouring women.

Methods: Institutional REB approval and written informed consent were obtained. All the three ASA II women requested epidural for analgesia during the first stage of labour, with a cervical dilation of 4 cm. Case 1: a 27-yr-old primigravida at 40 weeks gestational age, initial pain Numeric Rating Scale (NRS) of 5. Case 2: a 32-yr-old primigravida at 41 weeks gestational age, initial NRS of 8. Case 3: a 29-yr-old multipara at 40 weeks gestational age, initial NRS of 6. For each case, standard monitoring including a pulse oximeter were connected to the patient. An epidural anesthetic was then performed at the L3-4 level, using LOR to saline technique. The needle was filled with 2-3 mL NaCl 0.9% and a high-pressure tubing extension leveled at L3-4 was connected to the needle and the pressure was transduced. Epidural pressure waveform was recorded for all patients at both a “rest” state (in between uterine contractions) and at an “active” state (during a contraction). Epidural catheters were threaded and all patients received a loading dose of 8-10 mL of 2% lidocaine, and the catheters were connected to a PCEA pump. Thirty minutes later, block levels and patient satisfaction (NRS) were recorded.

Results: For cases 1 and 2, a clear epidural waveform and pressure readings were obtained during both the “rest” and “active” states. During the “active” phase, an elevation of the epidural pressure was noticed (4 mmHg for case 1, 3 mmHg for case 2). At 30 minutes, both patients had a bilateral block (T10/T11 and NRS of 3 for case 1,
T9/T11 and NRS of 1 for case 2). For case 3, we were unable to obtain an epidural pressure waveform. At 30 min, she had an inadequate block (L1/L2, NRS remained at 6). After a bolus of lidocaine 2% 5mL, bilateral block (T10/T10 and NRS 1) was obtained.

**Discussion:** An epidural pressure waveform was identified in 2 of the 3 women, and correlated with an adequate bilateral block 30 min after epidural loading dose. The absence of a waveform on the 3rd case was associated with an inadequate block. The fact that case 3 had no waveform and an initial dysfunctional block could raise alert for a possible anatomic variation that prevented both epidural pressure reading and adequate local anesthetic spread.

**References:**


84995 - TIMING OF DEXAMETHASONE FOR POSTOPERATIVE PAIN IN CESAREAN SECTIONS

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Introduction: Over the last decade the potential analgesic benefit of single dose dexamethasone has been demonstrated in several surgical populations including patients undergoing cesarean sections (1,2). Timing of dexamethasone administration remains controversial due to its delayed peak effect as explained by its intranuclear site of action (3). The purpose of our study was to evaluate the hypothesis that single dose intravenous dexamethasone given 60-90 minutes preoperatively reduces visual analog scale (VAS) pain scores and improves quality of recovery in patients undergoing elective cesarean section as compared to the same dose given intraoperatively.

Methods: Upon obtaining approval from the local Research Ethics Board we performed a double-blind, randomized, placebo controlled trial involving forty full-term pregnant patients (American Society of Anesthesiologists Class 1 or 2) undergoing elective cesarean section. Enrolled and consented patients were randomly allocated into two groups to receive dexamethasone 0.15mg/kg intravenously either 60-90 minutes prior to scheduled operation or immediately after surgical incision. Exclusion criteria included contraindication to spinal anesthesia, allergy to the study drug, diabetes, active infection, adrenal axis pathology, chronic pain syndromes and recent or active treatment with steroids. The primary outcome was postoperative VAS pain scores. Secondary outcomes included postoperative analgesic use, presence and degree of nausea and vomiting as well as overall satisfaction with postoperative recovery.

Results: Postoperative VAS scores, overall satisfaction with recovery as well as nausea and vomiting were not significantly different between the two groups although lower VAS score in the early versus intraoperative administration of dexamethasone trended toward significance at the 12-hour time point. Administration of dexamethasone 60-90 minutes before surgical incision resulted in a significantly decreased acetaminophen consumption at 12 hours postoperatively when compared to the control group.

Discussion: The results of our study demonstrated a small yet significant reduction in postoperative acetaminophen consumption in the group of cesarean section patients that were randomized to receive early preoperative dexamethasone, suggesting improved therapeutic benefit of preemptive rather than intraoperative administration of this analgesic and antiemetic adjunct. Despite major limitations of our study such as small sample size, and absence of a placebo-arm as well as an underpowered design.
for the primary outcome, we believe that our findings are hypothesis generating and have important clinical implications further supporting the analgesic benefit of moderate dose dexamethasone in this surgical population. Furthermore, to the best of our knowledge our work comprises the first investigative report to compare the difference in the analgesic effect of early versus intraoperative administration of dexamethasone in patients undergoing elective cesarean section.

References:

85629 - CARBETOCIN AT ELECTIVE CESAREAN SECTION: 20 MCG VERSUS 100 MCG

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Introduction: Carbetocin is recommended by the Society of Obstetricians and Gynaecologists of Canada as the uterotonic of choice to prevent postpartum hemorrhage (PPH) post elective cesarean delivery (1). The recommended intravenous dose by the manufacturer is 100 mcg; however, 3 previous studies have shown that smaller doses may be as effective (2,3,4), and that the ED 90 could be as low as 14.8mcg (4). The purpose of this study was to compare the efficacy of 20mcg and 100mcg of carbetocin.

Methods: With institutional REB approval and informed consent of each participant, this study was conducted as a randomized double-blind, non-inferiority study. Women undergoing elective cesarean delivery under spinal anesthesia, who had no condition predisposing to PPH, were included in the study. They were randomized into two groups to receive either 20 mcg or 100 mcg of carbetocin intravenously upon delivery of the anterior shoulder of the baby. Uterine tone was assessed by the obstetrician at 2 and 5 minutes after carbetocin administration, according to a numerical verbal scale 0 to 10, where 0=atonic uterus and 10=firm uterus. If uterine tone was considered unsatisfactory by the obstetrician and additional uterotonic was deemed necessary, this was promptly administered according to usual practice at our hospital (oxytocin and/or ergot and/or carboprost). The primary outcome was the uterine tone (scale 0-10) at 2 minutes after carbetocin administration. Sample size was calculated at 102 subjects.

Results: Recruitment is underway and 28 cases have been completed until the preparation of this abstract. Overall, the uterine tone (mean±SD) was 7.8±1.6 and 8.2±1.0 at 2 and 5 minutes, respectively. Four women required the use of additional uterotonic within the first 24 hours. In these 4 cases additional uterotonic was administered intra-operatively; their uterine tone at 2 and 5 minutes was 6.5/6.5, 10/8, 7/8.5 and 8/6 and the time of request was 4, 11, 7 and 15 minutes after administration of carbetocin. The overall estimated blood loss (mean±SD) was 773±355 mL and the overall incidence of hypotension post carbetocin administration was 29%. At a recruitment rate of 24cases/month, we plan to recruit the last patient by April 2015.
Discussion: The overall uterine tone seems to be adequate in most patients, however, 21 and 7% of patients had uterine tone < 7 at 2 and 5 minutes, which in theory could prompt the request for additional uterotonics. It seems however, that the decision of requesting additional uterotonic is not based entirely on the assessment of tone, as only 2 of the 4 women receiving additional treatment exhibited tone < 7. Final discussion and conclusion will be presented at the meeting.

References:

1) J Obstet Gynaecol Can 2009; 31: 980-93
2) Can J Anesth 2012; 59: 751-7
3) Can J Anesth 2013 ;60:1054-60
Introduction: The parturient undergoes significant cardiovascular and physiologic stress in the peripartum period, however the vast majority tolerate labor well. We present a rare diagnostic conundrum in obstetric anesthesia, a patient with no known cardiac history develops acute and florid right ventricular heart failure post spontaneous vaginal delivery with epidural analgesia.

Discussion: Appropriate consent was obtained directly from the patient to publish this case report. We describe the case of a 32 year old female, G6P4 presenting in active labor at term. She had four previous uneventful spontaneous vaginal deliveries, all with intermittent intravenous analgesia. The patient did not describe any prior history of cardiac issues. She requested an epidural for analgesia, which was placed by the Obstetrical anesthesia fellow after appropriate consent was obtained. Starting immediately post partum she had progressive bilateral leg swelling and periorbital edema. A chest X ray was obtained which showed an unusually enlarged and globular shaped heart. She was noted to have the clinical signs of florid right heart failure and borderline hypoxic with room air sats of 91% and a P02 of 66. The obstetrical anesthesiology fellow performed a bed side echocardiogram without Doppler color images which revealed a moderately dilated right ventricular with no other obvious pathology. Cardiology was consulted for stat formal echo, and a CT to rule out PE was ordered. Pending consultations and tests, the decision was made to start IV heparin anticoagulation for the high index of suspicion that a large post partum pulmonary embolus was causing right ventricular failure. The CT chest eventually showed no evidence of pulmonary embolus, and the formal echo confirmed a moderately dilated right ventricle with normal valves and left sided function. It was noted however the patient had a 11-19mm atrial septal defect with significant left to right shunt, enough to explain the right ventricular failure. Her heparin was discontinued, she was diuresed with lasix, and arrangements were made to have a percutaneous closure of her atrial septal defect once she was clinically stable.

Results and Discussion: Although common complications such as pulmonary embolus should continue to remain high on the differential for pregnant patients, Anesthesiologists and Obstetricians should keep a broad differential that includes rare cardiovascular conditions when managing the peripartum complications of labor and delivery. This also serves to highlight the diagnostic role of bed side echocardiography in obstetric anesthesia.
85958 - EFFECT OF PULSATILE OXYTOCIN ON THE DESENSITIZATION OF MYOMETRIUM

Author(s)
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Introduction: Postpartum hemorrhage (PPH) secondary to uterine atony is a leading cause of maternal morbidity. The use of prolonged continuous oxytocin in labor can result in several adverse effects, including the ‘desensitization’ phenomenon,\textsuperscript{[1]} which attenuates the response of the myometrium to further oxytocin and can result in uterine atony. One human clinical trial has shown the effectiveness of pulsatile oxytocin when compared to continuous oxytocin for labor augmentation;\textsuperscript{[2]} however, PPH as a primary outcome has not been investigated. We aimed to investigate the effect of pulsatile oxytocin exposure, versus continuous oxytocin exposure, on the extent of myometrial desensitization.

Methods: After REB approval, and written informed consent from patients, this in-vitro experimental study was undertaken using myometrial tissue obtained during elective cesarean deliveries dissected into 6 strips (providing 2 strips/experiments per group). Each strip was mounted in a single organ bath with physiological salt solution (PSS) under homeostatic conditions and then subjected to either 1) oxytocin $10^{-5}$M pretreatment for 2h (to induce myometrial desensitization, as shown by our previous model\textsuperscript{[3]}); 2) PSS pre-treatment for 2h (control); or 3) alternating pretreatment of 15-minute exposures of oxytocin $10^{-5}$M and PSS (pulsatile); thereby providing 3 study groups. Following pretreatment, a dose-response to oxytocin $10^{-10}$M to $10^{-5}$M was performed. Contractile parameters were measured and compared across various groups. The primary outcome was motility index (frequency x amplitude), and secondary outcomes included frequency, amplitude and area under the curve. A sample size of 32 strips per group will be used (16 patients; 6 strips/experiments per patient), to detect a difference of 0.7-1.4 (0.25-0.35) g*contractions/10 min (sq root) in motility index (SE) between groups, with a 5% significance level and a power of 80%. Primary analysis will be undertaken with linear regression models adjusted for repeated measures through compound symmetry covariance structure.

Results: This study is currently underway with no results for analysis as of yet. We had, however, done pilot experiments to assess the feasibility of the model and to determine the study design. The completed analysis will be presented in the Annual CAS meeting, following recruitment of 16 patients (providing 96 experiments, at a rate of 18
experiments per week), and completion of the study by February 2015.

**Discussion:** Labor augmentation with continuous oxytocin is a significant risk factor for uterine atony. The delivery of pulsatile oxytocin, compared to continuous oxytocin, for labor augmentation is likely to result in less total administration of oxytocin, less oxytocin receptor desensitization, less attenuation of oxytocin-induced myometrial contractility and a lower incidence of PPH. The final discussion and conclusion will be presented at the Annual Meeting.

**References:**
3) Anesthesiology *2013*; 119: 552-561
PAIN POSTER DISPLAY
Saturday, June 20
12:00 PM - 1:00 PM

86111 - ERYTHROPOIETIN IN REFRACTORY PAIN AFTER CERVICAL SPINAL CORD INJURY
Primary Author / Presenting Author: Alireza Nekoui, Centre hospitalier de l'université de Montréal (CHUM), Montréal, Quebec
Co-Authors(s): Gilbert Blaise, Violeta del Carmen Escalante Tresierra, Sadegh Abdolmohammadi, Daniel Shedid
Track: Pain: Chronic - Basic & Clinical

77021 - ARTICULAR REHABILITATION UNDER REGIONAL ANESTHESIA: CASE SERIES
Presenting Author: Laura Girón Arango, CES University, Envigado, Not applicable, Colombia
Co-Authors(s): Roberto Carlo Rivera Díaz, Mario Andrés Arcila Lotero, Maria Patricia Gonzalez Obregón

86248 - MORPHINE WITH LOW DOSE NALOXONE ON RESPIRATORY FUNCTION AND ANALGESIA
Primary Author / Presenting Author: Sarah Maximos, Université de Montréal, Montreal, Quebec
Co-Authors(s): Sadegh Abdolmohammadi, Pierre Mayer, Gilbert Blaise
Introduction: Joint fibrosis is a complication that generates disability in patients after orthopedic surgery. The literature reports this complication most frequently in shoulder and knee surgeries. A key component of the treatment of articular fibrosis is physical therapy. However, when mobility is forced in the presence of fibrosis, severe pain is triggered creating a vicious circle. Restricted mobility generates pain and the pain itself restricts mobility. Continous regional anesthesia guided by ultrasound is an alternative that allows painless physical rehabilitation for several days. The objective of this study is to determine the clinical efficacy and safety of joint rehabilitation under continuous regional anesthesia in patients with postoperative shoulder and knee fibrosis.

Methods: With prior approval from the institution’s ethics committee, a prospective longitudinal descriptive study was conducted. 8 patients with postoperative articular fibrosis refractory to conventional management who consulted to our institute during July 2011 - July 2012 were included. Each patient signed a consent for publication. The patients underwent joint rehabilitation under regional anesthesia with the insertion of a peri-neural catheter guided by ultrasound at femoral level for patients with knee disease and inter scalene level for patients with shoulder disease. The patients went to 45-minute physical therapy sessions on an outpatient basis for 5 consecutive days. A total volume of 20mL of Lidocaine 1% with epinephrine was used during each session. Patients were followed for twelve weeks. The outcomes evaluated were pain intensity before and after physiotherapy, shoulder function, mobility of the knee and complications. The magnitude of pain was assessed using the Visual Analogue Scale (VAS). Shoulder function was assessed using the Shoulder Pain and Disability Index (SPADI scale). The mobility of the knee was assessed by goniometry.

Results: We analyzed a total of eight patients; four with shoulder disease and four with knee disease. Patients in both groups started with severe pain (VAS 8-10). At 12 weeks all patients reported mild pain (VAS 1-4). The difference in median VAS scores before and after therapy was 8 points; this was a statistically significant difference (p = 0.011). Only one patient in the knee group reported mild pain during therapy. The difference in the degree of functionality of the shoulder joint (SPADI scale) before and after physiotherapy was 67.7 points, which represented a statistically significant improvement (95% CI 60.9, 74.5 p value < 0.0001). The mobility of the knee joint, evaluated by goniometry, improved 108 degrees on average. The recovery of range of motion of the
knee was statistically significant (95% CI -153, - 64, p = 0.004). Two patients required relocation due to displacement of the inter-scalene catheter.

**Discussion:** Even though this is a small series of patients, the findings of this study show that when physical therapy is not possible due to pain in the case of shoulder and knee fibrosis, joint rehabilitation with regional anesthesia provided by a perineural catheter is an available, effective and safe alternative for providing painless therapy.

**References:**
5. BMC Musculoskelet Disord. 2007;8:83.
Introduction: Erythropoietin has shown some promise in preclinical laboratory animal models of spinal cord injury. Erythropoietin has anti-inflammatory, neuroprotective and neurogenesis effects. We report a case of postoperative spinal cord injury with refractory pain that responded well to Erythropoietin.

Case presentation: Informed patient consent was obtained. A 42-year-old female patient presented with gait instability and progressive weakness in her right leg over a 6-year period. She was diagnosed as myelomalacia, and was candidated for cervical discectomy. After surgery, she suffered from right hemiplegia due to spinal cord injury. On second postoperative day, she complained of severe neuropathic pain in her right extremities. She was treated with Pregabalin and opioid analgesia. Lidocaine 75 mg/h/IV-infusion, N-Acetyl-Cysteine 600 mg/PO-BID, Ketamine 5 mg/PO-BID, and Naloxone 1 mg/PO-BID were started by the Pain-Service the sixth postoperative day. The next day, the pain was as before, so Erythropoietin (Aranesp 100 mcg/day SC three days) was added. The patient recovered progressively after Erythropoietin therapy.

Discussion: Based on patient’s history, her pain did not respond to routine medications. After adding Erythropoietin the pain resolved progressively. The authors suppose that, the Erythropoietin played an important role in improvement of patient’s problems. Following spinal cord injury, vascular disruption and ischemia ensue with a pathological cascade; Swelling and edema secondary to released inflammatory substances jeopardize regional blood flow leading to apoptosis and necrosis (figure 1). EPO induces a broad range of cellular responses in the nervous system which could protect and accelerate the healing process (Table 1). EPO has neuroprotective effects in in vitro models of trauma, hypoxia and hypoglycemia.

It protects ischemic cells from oxidative damage, prevents neuronal apoptosis, and attenuates necrotic cell death. EPO also prevented excitotoxicity in neuronal cultures. The other tissue-protective mechanisms of EPO are its abilities to stimulate vascular endothelial growth factor secretion, increase angiogenesis, and protect vascular integrity.
Moreover, Erythropoietin stimulates vascular endothelial growth factor secretion, axonal regrowth, and dendritic sprouting\textsuperscript{4}. In addition, EPO regulates neurotransmitter synthesis, release, and intracellular calcium\textsuperscript{2}.

EPO reduces inflammation by decreasing inflammatory cytokines, by attenuating reactive astrocytosis\textsuperscript{2,4}.

Recent studies suggest that erythropoietin should be given as single high dose to exert a rapid neuroprotective effect\textsuperscript{5}. Although a high single dose of EPO does not show any hematopoietic side effects, other adverse consequences of Erythropoietin should be evaluated in clinical trials.

**Results and Conclusion:** This Case-Report draws the attention on the beneficial role of Erythropoietin in pain control, and neuron recovery. Future studies are required.

**References:**

2. Experimental & Translational Stroke Medicine 2009; 1:4
86248 - MORPHINE WITH LOW DOSE NALOXONE ON RESPIRATORY FUNCTION AND ANALGESIA

Author(s)
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Pierre Mayer - Université de Montréal
Gilbert Blaise - Université de Montréal

Introduction: Low back pain (LBP) is a major health issue affecting over 70% of people in industrialized countries. Neuraxial morphine is used as treatment. However, it is associated with side effects, among which respiratory depression being the most severe. The addition of low-dose of opioid antagonist, such as naloxone, has shown to enhance the analgesic effect and to decrease the side effects of neuraxial morphine. This study aims to evaluate the effect of epidural morphine combined with low-dose naloxone on respiratory function and analgesia among patients already treated with oral opioids or cutaneous opioid patch.

Method: Local Ethics Committee approval was obtained. Subjects who agreed to participate provided written informed consent. A randomized, double-blind, crossover controlled clinical trial was conducted. Each of the 28 patients received 2 treatments in a crossover manner: 1 mg morphine + 10 mg bupivacaine with or without 0.08 mg of naloxone. There was a 14-day washout period. For each treatment period, respiratory disturbance index (RDI), mean (SpO\textsubscript{2}m) and minimal oxygen saturation (lowest SpO\textsubscript{2}) were recorded to evaluate the respiratory function, and pain intensity was measured according to a visual analogue score (VAS).

Results: There was no statistically significant effect of morphine with or without naloxone on the respiratory parameters. Both treatment groups presented a significant difference in pain intensity for 14 days following the epidural treatment compared with baseline (P < 0.001), but neither treatment showed better analgesia.

Discussion/Conclusion: 1 mg of epidural morphine with or without 0.08 mg of naloxone is not associated with any significant effects on respiratory function. The analgesia of epidural morphine lasted more than 24 hours. The administered dose of naloxone (0.08 mg) is too low to antagonize the analgesic effect induced by morphine, but too high to potentiate it. Further studies are warranted to define the best morphine to naloxone ratio to enhance analgesic efficacy of morphine.

References:
PATIENT SAFETY POSTER DISPLAY
Sunday, June 21
11:30 AM - 12:30 PM

82667 - PERIOPERATIVE MANAGEMENT OF RENIN ANGIOTENSIN SYSTEM ANTAGONISTS
Primary Author / Presenting Author: ManCho Ng, University of Calgary, Calgary, Alberta
Co-Authors(s): Melinda Davis, Andrew Walker, Andrew Walker, Melinda Davis

83021 - PERIOPERATIVE INTRAVENOUS FLUID VOLUME PROLONGS SURGICAL RECOVERY
Primary Author / Presenting Author: Zeenia Aga, University of Toronto, Faculty of Medicine, Toronto, Ontario, Canada, Toronto, Ontario
Co-Authors(s): Matthew Machina, Stuart McCluskey

83100 - INTRAOPERATIVE ANAPHYLACTOID REACTION TO MIDAZOLAM: A CASE REPORT
Primary Author / Presenting Author: Daniel Dubois, Department of Anesthesia & Perioperative Medicine, University of Manitoba, Winnipeg, Manitoba

83706 - PREVALENCE OF FATIGUE RELATED RISK AMONG LOCAL ANESTHESIA RESIDENTS
Primary Author / Presenting Author: Huda y. Khayyat, King Abdulaziz University, Riyadh, Not applicable, Saudi Arabia
Co-Authors(s): Abeer A. Arab, Abeer Arab

84208 - AIRWAY INJURY AFTER DIFFICULT INTUBATION UNDER ANAESTHESIA
Primary Author / Presenting Author: Megan Jess, University of Saskatchewan, Saskatoon, Saskatchewan
Co-Authors(s): Jennifer St.Onge, Rashid Mehmood

84282 - A SURVEY ON PREOPERATIVE FASTING PROTOCOLS AND PRACTICES
Primary Author: Navraj Chima, University of British Columbia / Anesthesia / PGY-2, Vancouver, British Columbia
Author: Richard Merchant, University of British Columbia, New Westminster, British Columbia
Co-Authors(s): Olle Ljungqvist, Julianna Kok, Roger Maltby, Richard Merchant
85092 - BED BRACKET FAILURES: AN ANALYSIS AND PATIENT SAFETY IMPROVEMENT.
Primary Author / Presenting Author: Kelvin Kwan, University of Ottawa, Ottawa, Ontario
Co-Authors(s): Lucie Filteau

85167 - SURGICAL EMPHYSEMA POST TRANSANAL MINIMALLY INVASIVE SURGERY
Primary Author / Presenting Author: Hesham Youssef, Western University, London, Ontario
Co-Authors(s): Kevin Teague

85562 - QUALITY OF RECOVERY IN PATIENTS UNDERGOING MAJOR SURGERIES
Presenting Author: Oana Predescu
Co-Authors(s): Debora Liotta, Oana Predescu, Julia Munden, Franco Carli

86014 - IMPACT OF SURGICAL SPECIAL CARE UNITS: A SYSTEMATIC REVIEW PROTOCOL
Presenting Author: Nicholas Mendis, University of Ottawa, Ottawa, Ontario
Co-Authors(s): Manoj M Lalu, Gavin M Hamilton, Daniel I McIsaac, Daniel Dubois, Homer Yang, Hannah Wunsch, Colin McCartney, Lauralyn McIntyre, Dean A Fergusson

86039 - DIFFERENT STOP-BANG SCORES FOR OSA PATIENTS IN VARIOUS POPULATION.
Primary Author / Presenting Author: Mahesh Nagappa, Toronto Western Hospital, University Health Network, TORONTO, Ontario
Co-Authors(s): Pu Liao, Frances Chung

86174 - EHANDEOVER: AN ELECTRONIC TOOL FOR SAFE HANDOVER OF CARE (PILOT)
Primary Author / Presenting Author: Jordan Hudson, The Ottawa Hospital, Ottawa, Ontario
Co-Authors(s): Peggy Guilbeault, Allen Huang, Kathy Momtahan, Glen Geiger
82667 - PERIOPERATIVE MANAGEMENT OF RENIN ANGIOTENSIN SYSTEM ANTAGONISTS

Author(s)
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Co-Authors(s)
Melinda Davis - University of Calgary
Andrew Walker - University of Calgary
Andrew Walker - University of Calgary
Melinda Davis - University of Calgary

Introduction: Blockade of the renin angiotensin system (RAS) with ACE inhibitors (ACEi) or Angiotensin II receptor blockers (ARBs) is common in patients being treating for hypertension and cardiovascular disease [1]. Evidence is limited to guide anesthesiologists in the management of these drugs in the preoperative period [2]. Practice ranges from stopping or continuing these drugs on every patient, to decisions made on a case by case basis [3,4,5]. This study sought to identify the current practice of anesthesiologists and internal medicine specialists in the management of RAS blockers in the preoperative period to assist with the development of guidelines at our institution.

Methods: Application of our institution’s ethics tool indicated a full ethics review was not required. 102 email invitations to complete the online 15 question survey were sent to anesthesiologists (ANES) and pre-op clinic internists (IM) in our region.

Results: 77.5% of ANES and 21.5% of IM completed the survey. Regarding management of ACEi pre-operatively 16.5%, 16.5%, and 67% of ANES would always stop, would never stop, and would decide according to patient and procedure conditions, respectively, compared to 13.6%, 0%, and 86.4% of IM.

71.3% of respondents approach ACEi and ARBs similarly. Of those who manage them differently, 44% would always stop ARBs.

Rationale driving management included evidence from the literature (60.4%), and personal experience with difficult perioperative blood pressure control (64.9%). Significantly (p < 0.05) greater proportions of ANES cited simplicity of patient instruction as a factor (25.3% ANES vs 6.8% IM), but a greater proportion of IM noted that their rationale was driven by institutional expectation (29.5%IM vs 7% ANES).

Patient and procedure factors associated with the decision to hold RAS blockers were use of neuraxial block, with or without GA (71.6%), carotid surgery (62.5%), anticipated blood loss (77.8%), and perioperative fluid restriction (64%). The decision to give RAS blockers was most likely when sedation only was planned (67%). Ambulatory surgery had no influence as a factor.
75% and 82% of ANES and IM respectively would support development of a policy on preoperative management of RAS blockers. Of these, 78% of ANES vs 53% of IM (p < 0.05) would continue to support the policy if it were nurse administered without physician input for each patient. 55% of the respondents supporting the nurse administered policy make their decision regarding preoperative management based on patient and procedural factors themselves.

**Discussion:** There exists a broad range of practice in the preoperative management of RAS blockers. The majority of anesthesiologists and internists use patient and procedure factors to guide their decisions. While there is support for institutional guidelines for management, support decreases if these guidelines are being applied without direct physician input, perhaps reflecting that most physicians manage these drugs on a case by case basis.

**References:**
3. Curr Opin Anesthesiol 2010; 23:687–690
PERIOPERATIVE INTRAVENOUS FLUID VOLUME PROLONGS SURGICAL RECOVERY

Author(s)
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Stuart McCluskey - Toronto General Hospital, Toronto, Ontario, Canada

Introduction:

In major abdominal surgery, it is common practice to administer intravenous fluids perioperatively to adjust for acute changes in fluid hemodynamics and hypotension. However, emerging evidence suggests that the volume of intravenous fluids administered is an important risk factor for postoperative complications and prolonged length of hospital stay (Corcoran et al. 2012). Our objective was to determine if perioperative intravenous fluid volume is associated with length of hospital stay (LOS) and complications after colorectal surgery.

Methods:

After obtaining the appropriate Research Ethics Board approval, data were retrospectively collected on adult patients who underwent inpatient colorectal surgery from 2008-2013. The primary outcome was prolonged LOS, defined as a LOS above the median (8.2 days). Secondary outcomes investigated included post-operative complications (pulmonary edema, acute renal failure and myocardial infarction) and postoperative death. The impact of fluid volume on LOS was examined using multivariable logistic regression. Surgical, anesthetic and patient variables were included in the model. Intravenous fluids included normal saline, balanced salts, hydroxyethyl starch and albumin (5%).

Results:

During the study period, 1,615 patients underwent colorectal surgery and complete perioperative data was available for 1,242 patients. The majority of these cases were elective (57.4%) oncology cases with Charlson Comorbidity Index (CCI) ≥ 3 in 9.3%. The volume (L) of intravenous perioperative fluids administered was independently
associated with an increased probability of prolonged length of hospital stay, with an odds ratio of 1.31 (95% CI, 1.19-1.45, p < 0.01). In addition to fluid volume, four other risk factors were found to be associated with prolonged LOS: age > 65, CCI ≥ 3, estimated blood loss > 200mL, and emergent surgical cases. Goodness of fit was assessed using a receiver operating characteristic (ROC) curve with a C statistic of 0.78 and Hosmer-Lemshow statistic of 0.67. Postoperative morbidity was associated with prolonged LOS, but the number of adverse events was not sufficient in order to investigate the association of these secondary outcomes with perioperative intravenous fluid therapy, independent of the effect of perioperative intravenous fluids on LOS.

Discussion:

Larger volumes of intravenous fluids administered perioperatively are independently associated with increased LOS after colorectal surgery. While additional studies are required to demonstrate a causal relationship, the volume of intravenous fluid administered in the perioperative period is an important, modifiable potential risk factor for prolonged LOS that deserves further investigation. Further studies may also shed light on possible associations between perioperative intravenous fluid therapy and postoperative adverse events (morbidity), independent of their possible effect on morbidity indirectly through increased LOS.

References:
83100 - INTRAOPERATIVE ANAPHYLACTOID REACTION TO MIDAZOLAM: A CASE REPORT

Author(s)
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Primary Author / Presenting Author

Introduction: Anaphylaxis is a Type I immunoglobulin (Ig)E-mediated hypersensitivity reaction involving mast cells and basophils.
The incidence during the perioperative period is estimated to range from 1 in 3,500 to 1 in 13,000 cases.1 Though rare, hypersensitivity reactions occurring during anesthesia can rapidly evolve into life-threatening anaphylaxis. The most common agents known to cause hypersensitivity reactions are muscle relaxants, latex, and antibiotics.2 Although benzodiazepines are considered safe from hypersensitivity reactions, a review of the literature has described rare case reports outside North America.3-4
Here, I report a case of midazolam hypersensitivity, and discuss the important role of perioperative follow-up to avoid re-exposure.

Case Presentation: A 51-year-old caucasian male; 98Kg and 175cm, was scheduled to undergo surgery for a left Femur biopsy, and the placement of an intra-medullary stabilizing rod secondary to impending pathologic fracture. Five minutes following induction of general anesthesia and surgical draping, the patient was found to have severe refractory hypotension. There were no cutaneous or bronchial signs of a hyperreactivity reaction. Intra-operative and subsequent work-up failed to determine any cardio-respiratory or equipment related causes for this presentation. The hypotension responded immediately to the titration of intravenous epinephrine. Anaphylaxis was the diagnosis of exclusion owing to the profoundness of his hypotension. His case was cancelled with the knowledge that a repeat OR was required. Post-operative work-up of anaphylaxis and a referral to an allergist was sought. Intradermal Skin Testing (IDT) at 4 weeks showed that Midazolam was the sole reagent that tested positively in-vivo for an allergic reaction.

Conclusion: The perioperative period is a unique environment wherein a myriad of exposures and parenteral drugs are encountered that may lead to an adverse reaction. Anesthetists are more likely to encounter and manage immediate hypersensitivity reactions than other physicians. Given the rapidity with which a life-threatening situation can occur, the mechanisms, therapy, and investigations of allergic responses should be familiar to every anesthetist. The perioperative management should focus on developing an approach to reduce its incidence by identifying potential allergens prior to subsequent anesthetics. Prevention is paramount to decrease the occurrence of anaphylaxis. Close collaboration and consultation between the allergist and anesthesiologist is a key goal when investigating an allergy. A validated protocol should be used. Recent guidelines have been published in an effort to standardize the
investigation of presumed anaphylaxis. Documentation of events leading to anaphylaxis, immediate laboratory investigations, referral to an allergist, as well as appropriate labeling of the patient are essential to prevent future episodes. Failure of the above measures may lead to unnecessary fatal re-exposure.

References:


83706 - PREVALENCE OF FATIGUE RELATED RISK AMONG LOCAL ANESTHESIA RESIDENTS

Author(s)
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Introduction: An anesthesiologist must be vigilant during his shift to provide good care. Despite this fact, anesthetists are working long hours without structured support programs which is negatively affecting their mood, cognitive function and alertness. Several measures were acknowledged by the Joint Commission to ensure alert and watchful anesthesiologist before putting patients to sleep.(1) Hospital administrations are recommended to enforce such measures to decrease fatigue related risk. This study is taking the first step for our local anesthesia residents, which is evaluating fatigue related risk

Objective: To estimate prevalence of fatigue related risk among anesthesia residents in our country.

Methods: After local ethical approval has been obtained, all anesthesia residents were invited to voluntary participate. We have conducted a self-reporting survey that includes demographic data, Epworth sleepiness scale (ESS) and two scales to assess fatigue related risk. The first scale used is a Checklist for Individual Strength (CIS) that has been validated to assess fatigue in the working population. (2) The second is a predefined comprehensive fatigue risk assessment that was previously developed by the Australian Medical Association (AMA). (3)

Results: We received 102 responses, with more than half of the sample were at elevated risk of fatigue according to CIS measures and 58.6% (n=92) of the participants are excessively sleepy on ESS. On AMA risk assessment of work patterns 35% of the participants (n=60) were at moderate risk of fatigue and quarter of them are at higher risk.

Discussion and Conclusion: Our sample can be labeled to be fatigued and sleepy. Also, our population had a higher score in being excessive sleepy than general health care workers (59.78% vs. 39.3% representative sample in 3 hospitals locally) (4). Concluding that, such difference could be owed to the different type of population. Statistical analysis demonstrated that although the residents are fatigued, more than half of the resident were feeling motivated (62.54%). Being motivated wasn't enough to alter the overall risk of fatigability in our population.
All three scales suggest presence of fatigue related risk. This could be multifactorial; explained by long shifts, cultural and lifestyle habits. In the conference, we will explain our recommendation to start a Residents Well-Being Program to decrease fatigue, and increase awareness of healthy sleeping habits. Therefore, ensuring residents remain physically and mentally healthy and subsequently safer healthcare for our patients.

References:

Background: Airway related complications arising from difficult endotracheal intubations can cause significant morbidity. This study was designed to assess the rate of airway related complications associated with difficult endotracheal intubations during anesthesia at our institution and compare it with the complications rate reported in literature. This study was carried out at two acute care facilities in a specific urban location. The results are important as they may lead to initiatives to improve health outcomes for patients with difficult endotracheal intubations.

Methods: After appropriate ethics approval, all entries between Feb 1st, 2009 - March 31st, 2014 were retrieved from the difficult airway database of the Department of Anesthesia. Out of 216 patients contacted via phone 104 patients agreed to participate. After providing verbal consent participants answered a 5 - question survey about any airway related complications arising up to 72 hours postextubation. Additionally a retrospective chart review of the participating patients was completed. Data was analyzed using descriptive statistics, chi square tests and correlations.

Results: Sore throat (47.1%) and hoarseness (39.2%) were the most commonly observed complications. The average number of intubation attempts was 2.4. Video laryngoscopy was associated with the highest rate of success. Out of the 350 reasons listed BMI > 25, limited mouth opening, and Mallampati classification > II were the top three reasons for being difficult to intubate. Being male (χ² (1)=6.6, p = .01, Phi=.25) or having a GI/GU surgical procedure (χ² (4)= 14.97, p = .005, Cramer’s V =.38) were associated with lower rates of complication. Hoarseness was more commonly observed in females (χ² (1)= 5.18, p = .02, Phi= .23) and after Cardiothoracic surgeries (χ² (4)=11.94, p=.02, Cramer’s V=.34).

Discussion: The rate of complications for sore throat, hoarseness, pharyngeal lacerations, vocal cord paralysis, and broken/chipped teeth were all comparable or lower than what is reported in the literature except, laryngeal nerve damage which was greater. We also found that being male, overweight, or having a GI/GU surgical procedure was associated with lower rates of complications. Given the small cohort size and retrospective design of study, caution should be exercised in generalizing the results. A prospective study with a larger sample size can further examine the interplay of various factors on severity and duration of airway injury related to difficult airway management during general anesthesia.
References:

2. Anesthesiology 2004 100: 1146-50
3. Anesthesiology 1999 91: 1703-11
4. CEACCP 2006 6(2): 67-70
Introduction: Seminal work by Maltby and others in the 1980s and 1990s demonstrated that clear fluids are cleared from the stomach within 2 – 3 hours, thus negating the need for long periods of fasting (1). Recent evidence suggests that starvation – “NPO from midnight” – for clear liquids is not only unnecessary to allow for gastric emptying, but could also have deleterious effects in the peri-operative period (2). The widespread adoption of these evidence-based fasting guidelines has been slow. We present data from a recent survey of anesthesiologists from Canada, Australia, and New Zealand (ANZ) to determine current practices and perceptions around fasting guidelines.

Methods: Local ethics committee approval was obtained. An anonymous electronic survey was created using a web-based survey company. Practicing anesthesiologists were solicited by email via provincial and national anesthesia societies.

Results: 834 anesthesiologists (659 Canada; 175 ANZ) agreed to participate in the survey. Fasting guidelines were determined by an anaesthesiologist in 89% of hospitals in all countries; however, they were generally provided to patients by the preoperative clinic nurse (86.8% Canadian, 76.6% ANZ), and 34% of patients were informed by their surgeon. The majority (85%) of respondents followed society fasting guidelines. Preoperative fluids were encouraged by 46% of Canadian anesthesiologists compared to 64% of ANZ anesthesiologists. Reasons cited included a variable OR schedule (30.2% Canadian; 25.1% ANZ), and fear that the practice could not be safely implemented (21.1% Canadian; 14.2% ANZ). 23% of Canadians allowed patients to have solid food 6 – 8 hours before surgery, but 83% of ANZ physicians allowed this practice. Less than 1% of respondents stated they had ever seen a peri-operative aspiration event, yet more than 5% had seen adverse events from dehydration, and hypoglycemia. The majority of anesthesiologists reported having patients comment on enforced fasting prior to surgery (28.4% frequently; 58.4% rarely).
Discussion: Modern fasting guidelines allow for intake of fluids prior to surgery, yet clinical practice lags behind current recommendations. Despite the majority of anaesthesiologists indicating that they follow current fasting guidelines, less than half of them encourage their patients to drink liquids prior to 3 hours to OR, citing variability of OR times, and perception around patient safety, as reasons. Interestingly, the majority of ANZ anesthesiologists are comfortable with a light breakfast the morning of surgery (compared to less than 10% of Canadian anesthesiologists); this is likely due to the fixed morning and afternoon operating room schedule. Given increasing ambulatory surgery, enhanced post-operative recovery programs (such as ERAS), and potential detrimental effects of fasting from midnight, we hope our survey will help reveal ways in which traditional fasting policies can be changed to follow more current guidelines. We are investigating by expanding the survey to Europe and other countries.

References:


Introduction: In 2013, our perioperative patient safety committee identified a cluster of adverse event reports involving bed bracket failures. Bed brackets are devices that are clamped onto the operating room (OR) table to secure bed attachment equipment, such as lithotomy stirrups. Bracket failures are defined as the bracket (and the accompanying bed attachment equipment) falling off while in use, potentially causing serious patient injury.

Our initial goals were to investigate the frequency of bracket failures and identify contributing factors. The ultimate goal was to institute and monitor changes that would reduce bracket failures.

Methods: Local Ethics Committee approval was sought and waived. A multidisciplinary meeting was held to identify contributing factors. OR Nurses and OR Attendants at two sites of our hospital were also consulted at nursing rounds. Surveys were distributed and collected during these rounds, which resulted in equipment changes and new training protocols. Follow-up rounds and a repeat survey were conducted 3 months post intervention. Odds ratio and confidence interval (CI) were calculated using Microsoft Excel.

Results: Contributing factors identified included: 1) lack of sufficient training in bracket usage, 2) non user-friendly brackets, and 3) wide variety of bracket types (seven different types of brackets, each with distinct features).

The initial survey generated 91 responses (100% response rate). 29% of respondents had witnessed a bracket failure in the past 3 months. 13% of respondents reported receiving training in bracket usage. 35% felt the brackets were user-friendly, 78% felt there were too many types of brackets, and 33% felt comfortable using the brackets.

Our initial analysis led to the acquisition of new, user-friendly brackets, limited to two types. This initiative, implemented in September 2014, was followed by a widespread education campaign on proper bracket usage.

The follow-up survey generated 73 responses (92% response rate). 22% of respondents had witnessed a bracket failure in the past 3 months. 67% of respondents reported receiving training in bracket usage and 52% felt comfortable using the brackets.
(Figure 1). Survey respondents were 2.2 times more likely (Odds ratio 2.2, 95% CI 1.17-4.16) to feel comfortable using the brackets after the training initiative.

**Discussion:** Our initial survey results suggests that bracket failures were more frequent than previously thought. The comfort level in equipment usage was lower than expected, possibly due to a high variability in bracket types and low training rates. The follow-up survey demonstrated an improvement in comfort level and reduction in bracket failures. The variability between sites in bracket training rates suggests a relationship between training, comfort level, and reported witnessed bracket failures.

The education campaign will continue until achieving a training rate of 100%. Another survey will be conducted 6 months post implementation of the new brackets.
Introduction: Transanal minimally invasive surgery (TAMIS) is a technique first developed in 2009 for local excision of appropriately selected low-grade rectal neoplasia. Since its initial description, it has been used increasingly in the United States and internationally as an alternative to local excision and transanal endoscopic microsurgery for local excision of distal and mid rectum neoplasms.

We present a case of surgical emphysema, hypercarbia & pneumomediastinum that occurred during (TAMIS), which led to postoperative intensive care unit (ICU) admission. To the best of our knowledge, these complications have never been reported to occur during TAMIS.

Case Report: An 81-year-old woman was diagnosed with rectal adenocarcinoma. On MRI, the tumor was staged as a T2 N0 tumor. Although the surgeon recommended a low anterior resection as the standard care of T2 tumor, the patient elected to proceed with TAMIS given its decreased morbidity compared to major intra-abdominal procedure. Patient's informed consent was obtained.

In the operating room, standard monitoring was applied. Anesthesia was induced after adequate pre-oxygenation. The patient was positioned in the lithotomy position. TAMIS port was inserted. Pneumorectum was applied by insufflation of CO2 at a rate of 3 L/min with an insufflation pressure of 15 to 20 mmHg. The lesion included about 40% of the rectum circumference. As the rectum kept collapsing, the insufflation pressure needed to be increased by a few mmHg briefly. Eventually the tumor was excised. The defect was closed in running fashion.

Before the end of the surgery, the airway pressure and the end tidal CO2 began to increase. Chest auscultation revealed bilateral wheeze and ventolin was given through the ETT. The ventilation parameters were changed. 10 minutes later as the surgery concluded a significant amount of subcutaneous emphysema was noted on the face, neck and chest. End tidal CO2 continued to rise to 67 mmHg despite attempts to increase minute ventilation. The patient's hemodynamics were stable. Arterial blood gases (ABGs) revealed a pH of 7.07 and a pCO2 of 112 mmHg. Given the amount of emphysema and the high pCO2, the patient remained sedated and intubated, and was transferred to the ICU.
In the ICU, Chest X-ray revealed diffuse subcutaneous emphysema and evidence of pneumomediastinum. There was no definite pneumothorax. After a few hours of ventilation, the emphysema began to resolve. Further laboratory investigations revealed a normalizing ABGs with a pH of 7.38 and a pCO2 of 50 mmHg. There were no signs of rectal perforation. The patient was extubated and then discharged from the ICU with no further complications.

**Discussion:** Postoperative complications following TAMIS are often mild, but serious complications may occur. Emphysema from extra-peritoneal insufflation of CO2 during TAMIS could be a result of raised insufflation pressures, in combination with full thickness excision, causing decreased tissue integrity \(^2,^3\).

Once insufflation has stopped the CO2 should theoretically reabsorb. However, delayed hypercarbia may occur after the procedure, and respiratory failure may develop\(^3\). As such, prolonged patient ventilation and monitoring in an appropriate setting should be considered.

**References:**


Introduction: Post-operative quality of recovery is an important composite outcome tightly correlated with best care practices\(^1\). ERAS society and the Postoperative Quality Recovery Scale (PQRS) define recovery as a return to baseline scores in all the domains implicated in daily living: physical, social and psychological functions\(^2\). In order to advance our understanding of the areas that need improvements, we designed a descriptive study aiming to describe the characteristics and patterns of recovery in patients undergoing major abdominal, thoracic and orthopedic surgeries; as measurement tool we used the PQRS, a validated scale for assessing quality recovery\(^3\).

Methods: After obtaining Institutional Ethics Committee approval, 130 patients, age 20 to 89, undergoing major surgeries were enrolled in our prospective longitudinal descriptive study. The PQRS questionnaire was administered pre-operatively, as a measurement for the patient's baseline, as well as 40 minutes, 1 day, 3 days and 1 month post-operatively. While in the hospital, the questionnaire was conducted face-to-face, whereas following discharge from the hospital it was obtained via telephone. Patients' baseline demographics and potentially confounding perioperative factors were collected. Data are presented as mean ± SD for continuous data and as percentage for categorical data. Recovery was obtained through the PQRS website calculation tool. Overall recovery, as well as recovery in each domain was obtained. A Pearson's chi-squared test was used to compare patients who recovered to whose who did not return to baseline characteristics after surgery. \(p < 0.05\) was considered statistically significant.

Results: Our preliminary analysis finds that overall recovery at 1 month was the best in urological patients, although, even for those, only 50% of the assessed patients fully recovered. When looking at individual domains though, most of the patients recovered in the physiological, ADL and cognitive domains. The domains that skewed the overall recovery towards such a low percentage were the nociceptive and the emotional ones. Age, sex, type of anesthetics and length of surgery did not impact recovery. Patients enrolled in the enhanced recovery after surgery program were more likely to recover after surgery. Preoperative depression, pre-existing medical conditions with high ASA grade, poor postoperative pain control and postoperative complications were independent predictor factors for low quality of recovery after surgery.
**Discussion:** To our knowledge, this is the first study analyzing the quality of recovery in a large number of patients undergoing different major surgeries. The preliminary results of our study are consistent with the literature: the ERAS program and good postoperative pain control are already proven benefits in improving the quality of recovery after surgery\textsuperscript{4,5}. The study confirmed the ability of PQRS to discriminate recovery in each domain and highlighted the need of finding specific strategies to improve the quality of recovery after each types of surgery, adapted to the particular patient's profile.

**References:**
**Introduction:** The overall incidence of post-operative complications is 10% and high-risk emergent surgery patients are associated with 30-day mortality rates of 9-18%. This may be in part due to difficulty in stratifying post-surgical patients appropriately within a two destination, ward vs. ICU, model of care. We hypothesize that the institution of an intermediate, third level of care (termed surgical special care unit, or SSCU) improves the surveillance of at-risk surgical patients and may lead to global improvements across surgical patient outcomes. Although a universal definition of SSCUs does not exist, they generally provide continuous monitoring, a high nurse:patient ratio, and intensive medical care in the absence of mechanical ventilation. Our systematic review is designed to answer the question, “In adult non-cardiac surgical patients does a three-level model of care delivery (i.e. ward, SSCU, ICU) compared to a two-level model of care (i.e. ward, ICU) affect post-operative mortality (in-hospital deaths or 30 day mortality)?”

**Methods:** Ethics approval was not required as this is a review of published literature. The protocol for this systematic review will be registered with PROSPERO. A systematic search of Medline, CINAHL, Embase, and the Cochrane library has been designed in collaboration with an information specialist, and a Peer Review of Electronic Search Strategy (PRESS) review of the strategy has been performed. The 2139 returned citations will be screened and data extracted in independently by two reviewers using piloted datasheets in DistillerSR. Disagreements between reviewers will be resolved through discussion with a senior team member. We will compare exposure to a two-level care model to exposure to a three level care model. All studies that include perioperative non-cardiac surgery patients will be included. Eligible studies will include randomized controlled trials and non-randomized comparator studies (e.g. controlled
before-after studies, interrupted time series and repeated measures studies). Outcomes reported in similar manners (hospital level, patient level) will be pooled. Meta-analysis using random effects modeling will be performed for the primary outcome of in-hospital or 30-day mortality, as well as selected secondary outcomes (e.g. serious adverse events, hospital resource utilization, measures of patient experience, and measures of processes of care). All data will be expressed with appropriate ratios and confidence intervals. Risk of bias will be assessed using either the Cochrane Risk of Bias Tool for randomized studies or A Cochrane Risk Of Bias Assessment Tool: for Non-Randomized Studies of Interventions, as appropriate. The results of this review will be reported according to PRISMA guidelines.

**Discussion** This will be the first systematic review of SSCUs. Results of this systematic review will help define the impact of SSCUs on the care of high-risk perioperative patients. In addition, it may help guide future studies investigating the role of SSCUs in perioperative care.
86039 - DIFFERENT STOP-BANG SCORES FOR OSA PATIENTS IN VARIOUS POPULATION.

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Introduction: The diagnosis of patients with suspected obstructive sleep apnea (OSA) is important because of the increased risk of perioperative complications. Polysomnography (PSG) - the gold standard for diagnosis of OSA - is time consuming and costly. The STOP-Bang questionnaire is a validated screening tool for obstructive sleep apnea. We conducted this systematic review and meta-analysis to compare the effectiveness of different STOP-Bang scores to screen OSA patients in the sleep clinic and surgical population.

Methods: A search of the literature databases MEDLINE (from 2008 to April 2014), Medline-in-process & other non-indexed citations (up to May 2014), Embase (from 2008 to May 2014), Cochrane Central Register of Controlled trials (up to May 2014), Cochrane Databases of Systematic Reviews (from 2008 to march 2014), Google Scholar, Web of Sciences (from 2008 to August 2014), Scopus (2008 to August 2014) and PubMed (from 2008 to August 2014) was carried out. The search yielded 340 citations. Irrelevant papers were excluded by title and abstract review, leaving 46 manuscripts. Inclusion criteria were: 1) Studies that used different STOP-Bang scores as a screening tool for OSA in adult subjects (>18 year); 2) The accuracy of the STOP-Bang questionnaire was validated by polysomnography - a gold standard for diagnosing OSA; 3) OSA was clearly defined as apnea/hypopnea index (AHI), respiratory disturbance index (RDI) ≥ 5; 4) Publications in English language. Validity criteria assessing internal and external validity were explicitly described and coded according to Cochrane Methods group on screening and diagnostic tests. Statistical analysis was carried out using the Review Manager 5.3 software. The data about predictive parameters were pooled.

Results: Six studies (n=2807) qualified for the data collection to pool the predictive parameters of each STOP-Bang score cut-offs for the different AHI levels. Out of which four studies (n=1980) were from the sleep clinic population and two studies (n=827) from the surgical population.

In the sleep clinic population, as the STOP-Bang score increased from 1 to 8, the specificity and positive predictive value (PPV) increased continuously from 1% to 100% and 88.7% to 100% for all OSA (AHI ≥5); 1% to 100% and 67.5% to 95.1% for moderate-to-severe OSA (AHI ≥15); and 1% to 100% and 41.7% to 85.7% for severe
OSA (AHI ≥30) respectively (Table 1A). On the other hand in the surgical population, as the STOP-Bang score increased from 1 to ≥7/8, the specificity increased from 3% to 98% and the PPV increased from 68.6% to 81.6% for all OSA (AHI ≥5); 7% to 95% and 40% to 36% for moderate-to-severe OSA (AHI ≥15); and 2% to 97% and 18% to 32% for severe OSA (AHI ≥30) respectively (Table 1B).

**Conclusion:** The lower STOP-Bang score showed high sensitivity and NPV, while a higher STOP-Bang score showed higher specificity and PPV for all severities of OSA in the sleep clinic and surgical population.

**References:**

7. Sleep Breath 2014; DOI 10.1007/s11325-014-0971-3
Handover of care can be a risk to patient safety, particularly when critical information is missed or misunderstood. Implementation of a handover improvement program has been shown to reduce medical errors and preventable adverse events in a large multicenter trial (1). At our center, a current state analysis showed no consistent approach to handover of patient care, and wide variability of practice among physicians and services. A study of our hospital’s cardiac surgical patients found increased morbidity and mortality when anesthesia care was handed over intraoperatively (2).

We created the eHandover Working Group, a team of health care and information technology experts, to design a user-friendly electronic handover tool that would enhance face-to-face handover, while keeping patient information secure. After conducting a literature review, needs assessment, and current state analysis, we designed the Handover tool for our electronic medical record on the iPad mobile device. A collaborative design approach was used. Key features include the ability to flag acute patients, to share information within and across teams, and to identify problems and tasks.

Usability testing was conducted with residents across multiple disciplines, and an iterative design process was used for tool refinement. We began our pilot in December 2014 with physicians in anesthesiology and geriatrics. Our protocol was reviewed by the local ethics committee, and was deemed not to entail human subject research, with further review not required. Survey data is being used to collect feedback from participating resident and staff physicians. The pilot has successfully begun and further improvements to the Handover tool will be implemented based on data collected.

Our electronic Handover tool is an innovative new solution to facilitate safe and comprehensive handover of patient care. Close partnership between physician users and information technology experts has led to a user-friendly tool that will be used to improve patient safety as part of a multifaceted handover improvement program. Although designed as an integral part of our Clinical Mobile electronic health record, the key features and overall design of Handover are applicable to other physicians looking to develop and use an electronic handover tool.
References:
(2) J Cardiothorac Vasc Anesth 2014 (Epub ahead of print Nov 24)
PEDIATRIC ANESTHESIA POSTER DISPLAY
Saturday, June 20
12:00 PM - 1:00 PM

83715 - POSTOPERATIVE ANALGESIA AFTER LOWER LIMB DISTRACTION OSTEOREGENESIS
Primary Author / Presenting Author: Aya Sueda, Hyogo Prefectural Kobe Children's Hospital, Kobe-shi, Not applicable, Japan

84571 - A CASE OF MALIGNANT HYPERTENSION DURING KASAI PORTOENTEROSTOMY
Presenting Author: Erika R. Bock, University of Manitoba, Winnipeg, Manitoba
Co-Authors(s): David Lambert, Karthik Sabapathi, David Lambert, Karthik Sabapathi

85913 - SUDDEN ASYSTOLE IN ADOLESCENT IDIOPATHIC SCOLIOSIS SURGERY.
Primary Author / Presenting Author: Susan Goobie, Boston Children's Hospital, BOSTON, Massachusetts
Co-Authors(s): Amanda Morris, Michael Glotzbecker

85917 - COMPLEX TESSIER FACIAL CLEFTS PRESENTING FOR CRANIOFACIAL SURGERY.
Presenting Author: Susan Goobie, Boston Children's Hospital, BOSTON, Massachusetts
Primary Author: Brian Tinch, Children's Hospital, Boston, Boston, Massachusetts
Co-Authors(s): Mark Proctor, John Meara

85993 - REDUCTION IN CODE BLUE ACTIVATIONS IN THE POST ANESTHESIA CARE UNIT
Primary Author: Lindsay McMillan, University of Calgary, calgary, Alberta
Presenting Author: Haotian Wang
Co-Authors(s): Michael Letal, Haotian Wang

86063 - INTERNATIONAL WEB-SURVEY ON ARTERIAL LINE PLACEMENT IN PEDIATRICS
Primary Author / Presenting Author: Sylvain Tosetti, The Montreal Children's Hospital, Montreal, Quebec
Co-Authors(s): Gianluca Bertolizio, Vincent Collard, Pablo Ingelmo, Davinia Withington, Karen Brown
Introduction: Distraction osteogenesis is known to cause severe pain with patients, making postoperative analgesia crucial. We report the transition process of the postoperative analgesia in children after lower limb distraction osteogenesis over a seven-year period. The objective of this study was to evaluate the effectiveness, complications, and side effects of six different methods.

Methods: The local Research Ethics Board reviewed this case report and gave permission to publish in accordance with all national regulations. As all patient data is collected anonymously and retrospectively, national regulations do not require written patient consent. Sixty-two children underwent lower limb distraction osteogenesis between December 2007 and December 2014. In 2007, we performed epidural analgesia with ropivacaine (group E). A majority of patients reported severe pain, leading us in 2010 to use fentanyl with ropivacaine via epidural (group EF). In 2011, we began using peripheral nerve blocks and performed continuous sciatic nerve blocks with 0.2% ropivacaine. Some patients had only continuous sciatic nerve blocks (group S), while others had a combination of continuous sciatic nerve blocks and fentanyl infusions (group SF). In 2013, we began combining sciatic nerve blocks with continuous femoral blocks with 0.1% ropivacaine (group B). Some patients only received continuous fentanyl infusions (group F) because of contraindications to regional anesthesia, or due to patient or family request.

In groups E, S, and B, we calculated how many of the patients received intravenous fentanyl infusions as rescue analgesia because of a failure of initial pain management with regional anesthesia. In all groups, we calculated how many of the patients had severe pain (face scale score 4 or 5), postoperative nausea and vomiting (PONV), or whether they had had sensory or motor blockades.

Results: Results are shown in the table. Group B had the fewest pain management failures. Severe pain was lowest in group EF. Groups E, S, and B (without fentanyl) had lower rates of PONV. Intravenous fentanyl infusion combined with regional anesthesia decreased the rate of severe pain, but increased PONV. For peripheral nerve blocks, there were no sensory or motor blockades with the use of 0.1% ropivacaine.

Discussion: In group S, 75% of patients reported severe pain, indicating that only continuous sciatic nerve blocks were insufficient. Therefore, we later combined continuous femoral nerve blocks with sciatic nerve blocks. However, it is crucial to not exceed the maximum dose of local anesthetic, especially with lower weight children. Group B had the best analgesia in terms of effectiveness and having the fewest side effects.
effects. Nevertheless, over 44% of all patients in this study had severe pain, indicating that none of the methods were yet sufficient. We concluded that we must have a backup plan in such cases. Limitations of this study included that the n-values were too low for each group (preventing a statistical analysis), we had no specific protocol for administration of acetaminophen or NSAIDs, and the technical skills of anesthesiologists were unstable during early uses of peripheral nerve blocks.

References:

1 J Bone Joint Surg Br. 2011 93: 1562-1567
Introduction: Biliary atresia is a progressive, obliterative cholangiopathy of the intra- and extra-hepatic biliary tree presenting in infancy. Left untreated, this condition is universally fatal. The Kasai procedure is the primary treatment for biliary atresia (1). This palliative operation involves hepatic portoenterostomy, followed by Roux-en-Y jejunal loop formation and anastomosis to the hepatic hilum, re-establishing bile flow. We report a case of a 3-month-old infant male undergoing the Kasai procedure who experienced iatrogenic epinephrine overdose secondary to epinephrine soaked surgical packing. The subsequent malignant hypertension resulted in pulmonary edema, mesenteric ischemia and lactic acidosis which required aggressive treatment with multiple pharmacologic agents. This case highlights the importance of closed-loop communication in the operating room.

Methods: Using PubMed, a literature search was performed to identify any existing guidelines on the use of topical epinephrine in Kasai portoenterostomy. Parental consent was obtained for this case report.

Results (n/a)

Discussion: Currently, there are no guidelines or established protocols to aid surgeons and anesthesiologists in choosing an appropriate dose for topical epinephrine administration. Systematic reviews, case reports and randomized controlled trials in the otolaryngologic and burn literature have suggested that topical use of undiluted, 1:1000 epinephrine is safe in nasal surgery, tonsillectomy and burn surgery (2,3). Interpretation of results is made difficult by large variability in volume and concentration of epinephrine applied. Case reports cite adverse effects including tachyarrhythmias, myocardial ischemia and infarction, hypertensive crises, pulmonary edema, cardiogenic shock and death when topical epinephrine is used in endoscopic nasal and reconstructive burn surgery (2,3,4,5). Our review of the literature found no reports of regular use of topical epinephrine in Kasai portoenterostomy.

Surgical and anesthesiology teams should practice clear, closed-loop communication during the application of epinephrine. Preoperative briefings have been shown to
increase patient safety by improving team communication (6). Studies in patient safety have focused on operating room culture, suggesting that while teams operate in the same physical space, a strong hierarchical environment persists. In our case, the operating room nurses supplied 1:1000, undiluted epinephrine to the surgeon, who administered the drug via surgical packing to the liver bed, while the anesthetist remained unaware that the drug was being used in the surgical field. Malignant hypertension with pulmonary edema, mesenteric ischemia and lactic acidosis ensued. Many factors contributed to this communication breakdown, including a long, complex operation, fatigue, a large surgical team, and reluctance to challenge team members.

Our case highlights the importance of performing a comprehensive surgical safety checklist with all team members present and maintaining clear communication intraoperatively. Due to this adverse event, our department is looking into developing an institutional guideline regarding the use of topical vasoconstrictors.

References:


2) J Burn Care and Rehab. 2003; 24(5): 297-305.


A 13-year-old 44 kg girl with adolescent idiopathic scoliosis was scheduled for posterior fusion of the thoracic spine from level T6 to T12. Her curvature was 48 degrees. As per standard institutional and investigational review board policy, permission was received from the patient and her family to publish this report. Past medical history was significant for migraine and trigeminal autonomic cephalagia, for which she took carbamazepine. She had no other past surgical history, and her physical exam and laboratory results were otherwise unremarkable.

After midazolam premedication, standard monitoring and administration of oxygen, she underwent induction and intubation with fentanyl, propofol, and rocuronium. Due to somatosensory evoked potential and motor evoked potential monitoring, anesthesia was maintained with 0.5MAC of isoflurane and infusions of propofol and fentanyl. She also received tranexamic acid. The patient was turned prone and supported on rolls placed longitudinally on a standard Jackson table frame. At incision, her arterial blood pressure was 99/60, heart rate 72, oxygen saturation 100%, and esophageal temperature 35.7.

Approximately 1.5 hours after surgical incision, there was a sudden loss pulse oximetry, of arterial line pressure, a flat EKG trace and decrease in end-tidal CO$_2$ from 36 to 18. There was no pulse palpated, and within seconds the neurophysiologist reported loss of EEG trace. Asystole was diagnosed. The causes included hypovolemia from compression of the inferior vena cava and cardiac tamponade-like pathophysiology from compression of the heart. The surgeons were immediately asked to stop all surgical manipulation, and they indicated that they had been applying downward pressure on the spine when placing spinal instrumentation. With cessation of surgical pressure on the thorax, there was spontaneous return of arterial blood pressure, pulses, EKG and pulse oximetry trace, and the neurophysiologic monitoring returned to baseline. ABG and blood tests were within normal limits. Surgery recommenced, and the patient was stable throughout the remainder of procedure except for a brief episode of bradycardia and hypotension with surgical pressure that immediately resolved once the surgical team was asked to apply less mechanical force. The total estimated blood loss during the procedure was 595 mL.

After tracheal extubation, the patient was following commands and her motor function
was intact. Postoperative EKG was unremarkable. Cardiology consult confirmed a normal cardiovascular exam. The postoperative course was uneventful. She was discharged on hospital day 10 with postoperative radiographs showing significant improvement of scoliosis.

Discussion: To our knowledge, this is the first report since the 1970 paper by Dykes, *Sudden Cessation of Cardiac Output during Spinal Fusion*, where similar phenomena of hypotensive episodes were associated with surgical pressure on the upper thoracic vertebrae. Anesthesiologists and surgeons should be aware of the potential for mechanical compression of the thorax causing sudden decrease in cardiac output during this procedure.

References:

85917 - COMPLEX TESSIER FACIAL CLEFTS PRESENTING FOR CRANIOFACIAL SURGERY.

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Introduction: Complex Tessier Facial Clefts are rare craniofacial anomalies, which encompass a wide array of facial and cranial vault defects ranging from palatine and midface clefts to large skull defects requiring extensive reconstructive surgery. A multidisciplinary team approach (with anesthesia, plastic surgery, neurosurgery and other medical specialties) is crucial for preoperative planning. Surgery consists of osteotomies, cranial bone remodeling with grafting and fixation. Anesthesia challenges include airway issues such as difficult mask ventilation, difficult intubation and a shared airway. Prolonged operative time in infants < 10kg is usual. Utilizing multimodal blood conservation strategies is important, as massive blood loss is an issue. We present 2 such challenging cases. As per standard institutional and investigational review board policy, permission was received from the patient’s families to publish this report.

Patient A: 19 month old 9 kg female, with a large midline Tessier facial cleft involving nose, palate and forehead, with developmental delay, and hypothyroidism. Surgical plan included facial bipartition, orbital and frontal bone reconstruction, and palatal repair. Preoperative Hct was 33 with normal coagulation profile and fibrinogen 286. Inhaled induction was challenging as the defect caused a poor mask fit. The patient's airway was secured with a video-assisted scope and the endotracheal tube was wired to the mandible. Surgical duration was 11 hours. EBL was 375 mL. Total fluids administered were crystalloid 540mL, 5% albumin 375mL and PRBC 293mL. Dopamine infusion and tranexamic acid were utilized. She was extubated with nasal trumpet placed by surgery. Postoperative Hct was 27, coagulation test borderline normal and Fibrinogen 124. ICU course was significant for mild upper airway obstruction.

Patient B: 5 month old 6 kg male, with large midline Tessier facial cleft and frontonasal encephalocele. Surgical plan included craniectomy for removal of encephalocele, bilateral orbital osteotomies, cleft lip and palate repair, and reconstruction of anterior cranial fossa. Preoperative Hct was 30, coagulation tests normal and fibrinogen 180. A
slow inhalation induction maintaining spontaneous ventilation was performed with two-hand technique of mask ventilation using an upside-down mask to give room for encephalocele. Direct laryngoscopy and intubation were successful. Surgical duration was 10 hours. EBL was 250 mL. Total fluids administered were crystalloid 725mL, 5% albumin 250mL and PRBC 306mL. Tranexamic acid was utilized. Postoperative Hct was 36, coagulation tests mildly elevated and fibrinogen 150. He was successfully extubated. ICU course was complicated by Diabetes Insipidus.

**Discussion:** Perioperative management of Tessier facial clefts involves a complex multidisciplinary approach. Issues include challenges with airway management including difficult mask fit, intubation and ventilation. Careful hemostasis, fluid and blood management techniques should be utilized to avoid hemodilution, metabolic acidosis and facilitate early and successful extubation.
Introduction: The purpose of this study is to determine if a code blue system that records only time and date of activations can be used to provide useful information for retrospective data collection that can then be used for quality improvement.

Methods: This study adheres to local Research Board Ethics regulations. The code blue management system (CBMS) was interrogated for the dates of January 1, 2007 to June 30th, 2014 in the Post Anesthetic Care Unit (PACU) at a children’s hospital. The time, date, location and length of activation were reported for each activation. This list was cross-referenced with an electronic report of all patients admitted to the PACU during the same time frame. If a patient was present at the time of activation, the patient’s health record was reviewed to confirm the event. If a code activation occurred when there were no patients present in PACU, the activation was deemed to be a test, which is consistent with weekly testing of the code blue system.

Results: The CBMS printed a report showing that the code blue button was pressed 939 times. 697 code activations were concluded to be tests. There were 201 code blue activations that were attributed to patients. 200 separate patients were found, with one patient having two separate events, 24 minutes apart. 18 activations were for simultaneous different button presses for the same event. There were 23 code blue activations where there was at least one patient in the PACU at the time of activation, but after all available charts were reviewed, no documented patient event could be found.

A control chart was created plotting the number of code activations per month versus month (figure 1). An upper control limit at 3 standard deviations from the mean is drawn at 6.72. The control chart indicates that there was between 0 and 7 code blue activations per month, with an average of 2.23 and a standard deviation of 1.48. There is one month (November 2013) above the upper control limit with 7 code blue activations.

Discussion: Looking at the control chart, the number of code blue activations per month is generally in control, with most of the variation due to common cause variation.
There is one month above the upper control limit, where special cause variation may be responsible. This study is the first step of an overall quality improvement project with the goal to decrease code blue activations in the PACU. Now that it is known that we can determine which patients are having events in the PACU using the CBMS and successfully use retrospective data collection, each event can be further scrutinized to shed more light onto the common causes and special cause variation.
86063 - INTERNATIONAL WEB-SURVEY ON ARTERIAL LINE PLACEMENT IN PEDIATRICS

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Introduction: Arterial catheters are routinely used during major surgeries and in critically ill patients for continuous hemodynamic monitoring and blood samplings. Rare but serious complications can occur, with higher incidence in neonates and infants.

Specific recommendations for primary sites of insertion, alternative sites, insertion techniques and maintenance are lacking, as well as recommendations to manage failures/potential complications.

The aim of this survey was to describe the clinical and technical approach to arterial cannulation among pediatric anesthesiologists of Canada, United States, Great Britain and Italy.

Methods: After local ethics committee approval, a 26-items web questionnaire was designed according to guidelines previously published for websurvey. Participants were asked to provide information regarding country of practice, academic position, years of experience, arterial cannulation preferences (preferred insertion sites, techniques, use of ultrasound), solutions used for maintenance and troubleshooting management. Three clinical neonatal scenarios were designed to adress certain technical and decisional aspects. Interviewer were contacted by theirs society of affiliation (CPAS, SPA, APAGBI and SARNePI). Descriptive statistic has been used for preliminary analysis.

Results: Most respondents are staff (93%), 52% full-time pediatric anesthesiologists, 56% work in a pediatric university hospital and 58% have > 10 years of experience. The radial artery represents the overall primary site in 88%. Clinical scenarios, answers regarding use of ultrasound and troubleshooting management are reported in Fig. 1.

In summary, 78% of the interviewers use intravenous catheters for radial artery cannulation. For femoral cannulation, 33% of providers use 3 F catheters or bigger. Most of respondents (75%) do not have guidelines for cannulation and do not assess
collateral perfusion prior radial/ulnar cannulation, and prefer landmarks/palpation to 2D ultrasound (20%).

Overall reported complications rate is 24%. The most common complications were temporary occlusion (42%), hematoma (33%) or thrombosis/embolism (12%). In children < 10 kg, the keep Artery Opened (KAO) regimen was heparin 1Ui/ml in 42% and normal saline in 32% of the cases; 4% uses pressure bags.

**Discussion:** This preliminary analysis shows a relative uniformity of practice among experienced pediatric anesthesiologists, who declared having high success rate and low morbidity with traditional techniques. Radial is still the preferred site, despite axillary and brachial accesses have shown to carry similar risks.

2D ultrasound is mostly limited as a rescue technique, although data indicates high first attempt success rate and shorter cannulation time. Few responders use pressure bags, which carry risk of serious complications.

On note, 33% of responders cannulate the femoral artery with big size catheters, which correlate to risk of thrombotic complications.

**Conclusion:** Further analysis between countries and regions, as well as group of responders (years of practice/experience and position) may give more insight into arterial line placement management but will require completed data and is not yet possible.

**References:**

82927 - RCT OF CESAMET® (NABILONE) FOR PREVENTION OF PONV IN ELECTIVE SURGERY
Presenting Author: David N. Levin, University of Toronto, Toronto, Ontario
Co-Authors(s): David Mazer, Greg Hare, Zack Dulberg, Jullian Lee, An-Wen Chan, Aaron Hong

82997 - FUNCTIONAL CONNECTIVITY IS PRESERVED UNDER SEVOFLURANE ANESTHESIA.
Primary Author / Presenting Author: Lakshmikumar Venkat Raghavan, Toronto Western Hospital, University of Toronto, Toronto, Ontario
Co-Authors(s): Vincent Wourms, Adrian Crawley, David Mikulis

83393 - HEMODYNAMIC STABILITY IN PHEOCHROMOCYTOMA RESECTION
Primary Author / Presenting Author: Margaret Livingstone, University of Calgary, Calgary, Alberta
Co-Authors(s): Kaylene Duttchen, Jenny Thompson, Zahid Sunderani, Geoffrey Hawboldt, Sarah Rose, Janice Pasieka

85112 - GLUTAMATE RECEPTOR CHANGES IN EXPERIMENTAL SUBARACHNOID HEMORRHAGE
Primary Author / Presenting Author: Josh D. Bell, University of Toronto, Oakville, Ontario
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85581 - INTER-HEMISPHERIC EEG SYNCHRONIZATION WITH INTRA CAROTID ETOMIDATE
Presenting Author: Dana Baron Shahaf, Toronto Western Hospital, University of Toronto, Toronto, Ontario
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86036 - PHARMACOKINETICS OF ROCURONIUM IN LIVER TRANSPLANTATION SURGERY
Presenting Author: Qi Yang, University of Toronto, TORONTO, Ontario
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86061 - PHARMACOKINETICS AND PHARMACOGENOMICS OF ORAL OXYCODONE IN CHILDREN
Primary Author / Presenting Author: Patcharee Sriswasdi, Boston Children's Hospital, Newton, Massachusetts
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82927 - RCT OF CESAMET® (NABILONE) FOR PREVENTION OF PONV IN ELECTIVE SURGERY

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Introduction: Postoperative nausea, vomiting, or both (PONV) continues to be an important clinical problem. Untreated, one third of patients undergoing general anesthesia will have PONV. PONV frequently delays discharge, and is the leading cause of unexpected hospital admission after planned ambulatory surgery. Nabilone is a synthetic cannabinoid and a potent CB1 agonist which has been shown to be effective in preventing nausea and vomiting in patients receiving chemotherapy. Given the past success translating treatments for chemotherapy-induced nausea and vomiting (ie. 5-HT receptor agonists) for use in the perioperative environment, we hypothesized that preoperative administration of nabilone would reduce the rate of PONV in the PACU.

Methods: With prior REB and Health Canada approval, informed patient consent and trial registration, we conducted a double-blind, randomized, placebo-controlled, single-center trial of Cesamet® (nabilone) for the prevention of PONV. A priori sample size calculation indicated the need to treat a total of 330 patients to detect a 25% reduction in PONV when selecting patients with a high pre-operative risk of developing PONV (based on the presence of at least 3 of 4 Apfel risk factors) scheduled for elective surgery under general anesthesia. Patients were randomized to receive either nabilone (0.5 mg) or placebo by mouth 1 to 3 hours pre-operation and were followed until discharge from the PACU. The primary outcome is nausea or vomiting in PACU and secondary outcomes include the total number and dose of rescue medications, nausea scores, rates of medication side effects, time to discharge from PACU, rates of admission due to PONV, pain scores and adverse events.

Results: Target enrollment (n=330) was completed just prior to abstract submission deadline so datalock and unblinding have not yet occurred. Preliminary demographic data showed mean age of 50 (range;18-84 SD;15) and all female subjects. The categories of surgery are: Intra- or retro-peritoneal 16%; Head-and-neck surgery – 14%; Urologic or gynecologic – 41%; Orthopedic – 14%; Breast – 16%. Overall, 31% of patients reported PONV and/or were given antiemetic therapy prior to discharge from the PACU. After unblinding and primary and secondary outcome analysis, we will
perform a multivariate analysis to stratify outcomes based on preoperative risk of PONV, type of surgery and the number and types of antiemetics given prophylactically at the anesthesiologist’s discretion. Categorical data will be analyzed using a chi-square test, continuous data using a student’s t-test or ANOVA, and survival analysis will be performed using Cox regression, with a level of significance set as $P < 0.05$.

Discussion: This is the largest trial of nabilone for PONV to date. This study was designed to be pragmatic and generalizable, including patients for a wide range of surgeries and simple single dosing regimen taken just prior to surgery. If this trial shows nabilone to be efficacious for this application it could provide a new option with no known prolongation of QT interval to prevent PONV in patients at high risk for this adverse outcome.

References:


82997 - FUNCTIONAL CONNECTIVITY IS PRESERVED UNDER SEVOFLURANE ANESTHESIA.

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Background: Anesthetic agents dependably and reversibly abolish conscious perception, an event for which the ultimate mechanism remains elusive. Advances in brain imaging technology have allowed us a peek into this enigma. Defined regions of the brain are interconnected into networks that allow for complex processing of stimuli. These functional connectivity maps can be seen as fluctuations in blood-oxygen level, correlated to changing levels of brain activity, on MRI scans (BOLD-fMRI). Functional connectivity studies have shown that there are number of resting state networks that are reproducible at the individual level. The objective of this study is to look at the changes in resting state functional connectivity under 1 MAC sevoflurane anesthesia in mechanically ventilated patients.

Methods: After REB approval and informed consent, adults scheduled for MRI of the brain under general anesthesia were recruited for the study. Routine standard preparation of the patient for general anesthesia for MRI was carried out in all patients. Resting state fMRI scans were acquired in all patients on a 3 Tesla scanner at 1 MAC of sevoflurane concentration. During the study period, ETCO₂ and the blood pressure were maintained at baseline value. Spontaneous BOLD fluctuations are measured, and a seed-voxel analysis done to identify the resting state networks. Five networks were investigated, the default mode network (DMN), executive control network (ECN) as well as the auditory, visual and sensorimotor networks. For each seed taken separately, Pearson’s correlation r-values were calculated between the seed time-course and the time-courses at each grey matter voxel. The r-values were transformed into Fisher z values.

Results: Total of 21 patients were recruited for the study and data from 13 patients were included in the final analysis (7 men and 6 women, mean age 39 years). Under 1 MAC sevoflurane anesthesia, resting state functional connectivity is preserved in all the five networks. (figure1) For the DMN we identified connectivity in the posterior cingulate cortex/ precuneus (z=9.5), medial prefrontal cortex, middle temporal and parahippocampal gyrus. For the ECN, dorsolateral prefrontal cortex showed highest connectivity (z=8.6). For the auditory, visual and motor networks, insula (z=8.8), cuneous (z=8.2) and pre-central gyrus (z=8.5) showed increased connectivity respectively.
Discussion: To our knowledge this is the first study to show the persistence of resting state networks under surgical anesthesia (1 MAC Sevoflurane). Our results suggest that there is a continued activity within the DMN under 1 MAC sevoflurane anesthesia. DMN plays a role in conscious self-awareness, a property of brain activity thought to be abolished by general anesthesia. This study suggests that some components of consciousness may be preserved even under clinically significant doses of anesthetics. Further studies are needed to confirm these early findings.

References:

**Introduction:** Ideal perioperative management of pheochromocytomas / paragangliomas (pheo) is a subject of debate and can be highly variable. (1-4) The purpose of this study was to identify potential predictive factors of hemodynamic instability during pheo resection.

**Methods:** A retrospective review of pheo resections from 1992 to 2013 was done after obtaining ethical approval. Intraoperative hemodynamics, patient demographics, tumor characteristics, and perioperative management were examined. Post-operative intensive care admission, myocardial infarction, stroke and 30-day mortality were reviewed. Linear regression was used to analyze factors influencing intraoperative hemodynamics.

**Results:** During the 20-year study period, 100 patients underwent pheo resection. Postoperative morbidity and mortality was significantly reduced ($p = 0.003$) in the last ten years of practice. There was a trend towards greater morbidity and mortality with intraoperative hemodynamic instability ($p = 0.06$). The preoperative dose of phenoxybenzamine and number of laparoscopic procedures increased in the last decade (59 mg (95% CI 32, 108) to 106 mg (95% CI 91, 124) $p = 0.008$ and 27 vs 54%, $p=0.05$, respectively). Increased preoperative phenoxybenzamine dose was a significant predictor of improved intraoperative hemodynamic stability ($p=0.01$). Lack of intraoperative magnesium use resulted in greater hemodynamic instability as preoperative SBP increased ($p=0.002$).

**Discussion:** Post-operative outcomes following pheo resection have improved over the last two decades. Preoperative alpha-blockade plays a significant role in improving intraoperative hemodynamics and post-op outcomes. Increased doses of phenoxybenzamine and utilization of laparoscopic approaches have likely contributed to improved outcomes in the last decade. Intraoperative magnesium use may provide protection against hemodynamic instability and warrants further study.

**References:**


Introduction: Understanding the subcellular processes which contribute to cellular injury during stroke and traumatic brain injury may guide appropriate use of neuroprotective anesthetics during periods of neuron vulnerability. Glutamate is important in the pathogenesis of brain damage after cerebral ischemia, including subarachnoid hemorrhage (SAH). Notably, brain extracellular and cerebrospinal fluid (CSF) as well as blood glutamate concentrations increase after experimental and clinical SAH [1,2]. While neurons are one potential source of glutamate, platelets also release glutamate as part of their recruitment [3] and might mediate neuronal damage. This study investigates the hypothesis that platelet microthromboemboli release glutamate that mediates excitotoxic brain injury and neuron dysfunction after subarachnoid hemorrhage (SAH).

Methods: Ethics approval was received from the institutional committee on animal care. We used two models, primary neuronal cultures exposed to activated platelets, as well as a whole animal subarachnoid hemorrhage preparation. Propidium iodide was used to evaluate neuronal viability, and surface glutamate receptor staining was used to evaluate the phenotype of platelet exposed neurons.

Results: We demonstrate that thrombin-activated platelet-rich plasma releases glutamate, which exceeds concentrations of 300 micromolar. When applied to neuronal cultures, this activated plasma is neurotoxic, and attenuated in part by glutamate receptor antagonism. We also demonstrate that exposure to thrombin-activated platelets induces a marked downregulation of the surface glutamate receptor GluR2, a marker of excitotoxicity exposure and a possible mechanism of neuron dysfunction. Linear regression demonstrated that seven days following SAH in the animal there was a strong correlation between proximity to microthrombi and reduction of surface glutamate receptors.

Discussion: We conclude that platelet-mediated microthrombosis contributes to neuronal glutamate receptor dysfunction and might therefore influence clinical outcome following subarachnoid hemorrhage. Accordingly, we are hoping to begin a pilot trial on the use of ketamine for neuroprotection following SAH, which may confer neuroprotection through its anti-glutamatergic activities. This work was published in the...
Dec 2014 issue of the Journal of Neurosurgery.

References:

Introduction: Wada test is a diagnostic test performed to determine the language and memory lateralization prior to temporal lobectomy in patients with epilepsy. The procedure involved intra carotid administration of etomidate to anesthetize one cerebral hemispheres and assessing the language and memory functions of awake contralateral hemispheres. During the test, electroencephalogram (EEG) recordings are used to confirm the anesthetic effect. Currently we don’t know how etomidate injection affects the EEG and neurophysiological functions. Unilateral etomidate injection has been shown to increase not only the slow activity but also the faster activity, in some case even bilaterally. The aim of our study is to determine if the clinical effects of etomidate can be explained by a functional de-synchronization of EEG activity from the relevant targeted regions of the anesthetized hemisphere.

Methods: After IRB approval, we retrospectively analyzed the EEG data from 15 patients who underwent etomidate Wada test in our institution from August 2010 to December 2014. The EEG data from 3 time periods (before the etomidate injection, during the clinical effect and at least three minutes after the end of the clinical effect) were analyzed. Four electrodes (2 anterior (F3, F4) and 2 posterior (P3, P4)) out of 24 were analyzed. Samples were re-referenced to A1. We analyzed two frequency bands – alpha (7-13 Hz) for posterior electrodes (P3, P4), delta (1-4Hz) for anterior electrodes (F3, F4). After artifact rejection, we measured the anterior (delta) and posterior (alpha) inter-hemispheric connectivity before, during and after the drug effect using Matlab correlation function (http://www.mathworks.com/help/matlab/ref/corrcoef.html). The statistical analysis were done using paired t-test, where P value < 0.05 was considered statistically significant.

Results: Eleven out of 15 patients had left hemispheric injection of etomidate and the rest right-sided injection. EEG analysis showed increase in delta and alpha activity both in the injected side and the contra-lateral side (Figure 1-A). Connectivity analysis showed that 13/15 patients had significant de-synchronization between the hemispheres in the anterior delta frequency band. (Figure 1-B). Interestingly, de-synchronization of delta frequency recovered to higher synchronization level after
etomidate cessation, when comparing to the synchronization before the Wada test. Similar phenomenon was not consistently observed for the posterior alpha band (Figure 1C).

**Discussion:** Our study shows that intra-arterial etomidate injection results in anterior inter-hemispheric de-synchronization of frontal slow wave activity (delta). Frontal slow wave activity (delta) has been shown to be associated with attention/working memory and these frontal process probably play a major role in memory tasks.\(^5\,^6\) Hence the frontal de-synchronization of EEG activity probably affect the memory task and this could possibly explain the clinical effects during etomidate WADA test. Further studies are needed to validate this effect.

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Pharmacokinetics of Rocuronium in Liver Transplantation Surgery

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Background: Despite tremendous advancements in the management of liver transplantation (LT), there is no precise method to assess the function of transplanted organ. Transplant organs come from either Deceased Donors (DD) or Living Donors (LD). The metabolic activity of the donor organ depends on the size of the donor organ and the amount of donor organ damage as a result of cold or warm ischemia. In the case of DD and LD, their influences on liver function are quite different. Our objective was to investigate whether pharmacokinetic (PK) of two anesthesia drugs routinely used during LT [i.e. Rocuronium (ROC) and Tranexamic acid (TXA)] could serve as a marker to evaluate the function of transplanted livers. ROC was considered because it is metabolized partially by the liver, and TXA was chosen since it is eliminated exclusively by the kidney.

Methods: Following REB approval and written informed consent, 22 consecutive patients scheduled for LT were recruited. Patients were divided into two groups: DD (n=13, assuming 1500 g liver) received cadaveric livers, and LD (n=9, 672±89 g liver) received living livers. Immediately prior to reperfusion of the transplant organ, all patients were given 0.6 mg·kg⁻¹ of rocuronium (ROC). Tranexamic acid (TXA) was given as 1 g bolus at the beginning of LT followed by 10 mg·kg⁻¹·h⁻¹ for 2 h. Blood samples for PK analysis were collected at baseline and at 5, 30, 60, 180, 300, 420 and 540 min post TXA bolus, at 15, 120, 240, 360 min and 24 h after discontinuation of TXA infusion, and at 5, 30, 60, 90, 120, 180, 240, 300 and 450 min post ROC bolus. The plasma concentrations of TXA and ROC were measured by solid phase microextraction (SPME)-based extraction and liquid chromatography mass spectroscopic (LCMS) analysis as described previously¹,². PK analysis was conducted using a PKPD modeling software, ADAPTS® (BMSR version 5, USC).
**Results:** After bolus of ROC, biexponential decay profiles fit a two-compartmental model, revealed a significant difference in ROC clearance (CL). Patients from DD transplant group had a significantly lower CL (0.157±0.050 mL·min⁻¹·g⁻¹ liver) compared to those from LD transplant group (0.265 ± 0.148 mL·min⁻¹·g⁻¹ liver), values comparable to those (0.21-0.31 mL·min⁻¹·g⁻¹ liver) in healthy subjects. By contrast, there was no difference in TXA CL (1.05±0.50 vs. 0.965±0.38 mL·min⁻¹·kg⁻¹; *P* > .05) or distribution volume (503±71 vs. 467±57 mL·kg⁻¹; *P* > .05) between two groups. Baseline creatinine concentrations (81.8±46.7 vs. 89.6±19.7 μM) and creatinine clearance (103.6±34.7 vs. 83.2±20.0 mL·min⁻¹) for LD and DD transplants were not significantly different (*P* > .05), suggesting normal renal function in both groups.

**Conclusions:** ROC CL was lower in DD than in LD transplant group which may indicate differences in the metabolic capacity of the donor organ immediately after reperfusion. In contrast, there was no difference in TXA metabolism which suggests there is no difference in renal function between the groups. Differences in the ROC metabolism may be used to assess immediate liver function.

**References:**

Introduction: Oxycodeone is among the most commonly used opioid for postoperative pain control. Studies have demonstrated marked variation in the pharmacokinetics (PK) of oxycodeone among pediatric population. The principal metabolic pathway of oxycodeone is N-demethylation via enzyme Cytochrome P450 3A4 (CYP3A4) to generate inactive noroxycodone. However, 11% is O-demethylated by CYP2D6 to become oxymorphone, the active and potent metabolite that exhibits about 40 times the affinity and 8 times the potency on μ-opioid receptors compared to the mother substance. Frequencies of cytochrome P450 2D6 (CYP2D6) enzyme phenotypes for the Caucasian population are: poor metabolizers 5–10%, intermediate metabolizers 65–90%, and ultra-rapid metabolizers 5–10%. Ultra-rapid metabolizers may be at risk for serious side effects in the commonly prescribed dose. Understanding oral oxycodeone pharmacokinetics and pharmacogenomics favors safe and effective use of this analgesic in a wide variety of pediatric surgical patients. There is little information of oral oxycodeone pharmacogenomics and its metabolites in pediatrics. The aim of this study is to characterize the population PK of oxycodeone and its metabolites (oxymorphone, noroxymorphone and noroxycodone) with specific respect to the pharmacogenomics.

Methods: This prospective cohort, single-center trial is approved by the hospital investigational review board. A total of 40 opioid-naive children, aged 0-6 years, scheduled for in-patient surgery, will be consented. Blood samples will be collected for the assay oxycodeone and its main metabolites at specific time intervals and for CYP3A4 and CYP2D6 genotype. Oxycodeone, oxymorphone, noroxymorphone and noroxycodonel levels at 10 time points will be assayed using LCMS (liquid chromatography- mass spectrometry) and single-dose Pharmacokinetics (PK) metric determined. CYP2D6 genotype will be determined to identify the ultra-rapid metabolizers.

Results: The preliminary analysis of 10 patients reveals an interpatient variability similar to that previously reported (1,2) (Figure 1). Some patients have a very short onset of
absorption with Cmax up to 10ng/mL, while others exhibit a lag time for absorption of at least 4h with peak concentrations under 4ng/mL. Although so far all these patients exhibit similar CYP3A4 expression, these differences in oxycodone plasma concentrations seem to agree with their CYP2D6 expression differences. Plasma concentrations using 250 mL of whole blood were analysed with state-of-the-art pharmacokinetics software.

**Discussions:** These preliminary results strongly suggest the paramount role of CYP metabolism in the systemic concentrations of oxycodone, and hence the need for its consideration in the dosing optimization of the drug.

Figure 1: Differences in onset of absorption and magnitude of oxycodone concentrations relative to CYPs 3A4 and 2D6 expression

**References:**
REGIONAL ANESTHESIA POSTER DISPLAY
Saturday, June 20
12:00 PM - 1:00 PM

84856 - EPIDURAL HEMATOMA ON SUBCUTANEOUS HEPARIN, ASPIRIN AND
CELECOXIB
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86028 - CONTINUOUS SPINAL ANESTHESIA IN A PATIENT WITH AORTIC
STENOSIS
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Introduction: Spinal epidural hematoma (EH) is a rare but devastating complication associated with neuraxial techniques. A case of EH following atraumatic epidural insertion, in a patient without risk factor, a normal coagulation profile and appropriate anticoagulation medication respecting the current ASRA guidelines, is presented. (Patient consented.)

Case report: A 62 year-old lady (52.3kg, 155cm BMI22) with lung cancer presented for a right upper lobe and middle lobe resection, lymph node dissection and thoracotomy. She is a smoker with history of hypertension, dyslipidemia and hypothyroidism and smoking. A T5-T6 epidural catheter was atraumatically inserted pre-induction. Her intraoperative course was uneventful. Postoperatively, an epidural infusion (bupivacaine 1mg/ml and fentanyl 3µg/ml) was started. Subcutaneous unfractionated heparin (UFH) 5,000 units every 12 h (BID) was started 5h after surgery together along with aspirin 80mg (patient's prior medication). Celecoxib 200mg BID was initiated on post-operative day (POD) one. Patient coagulation profile remained within normal limits.

On POD 3, at 21h00, the patient had back pain and the nurse bolused 4ml as per epidural orders and increased the epidural infusion rate to 10 ml/h. At 4h45AM of POD 4, the patient woke up with urinary retention, hemiparesis, bilateral lower extremity weakness more prominent on the right and T4-T10 bilateral sensory block. The epidural site was clean, non-tender with negative aspiration for blood. Epidural was stopped and a stat magnetic resonance imaging (MRI) was performed.

The MRI showed a T3-T6 hematoma (1.1cm x 0.6 cm, AP * transverse) with mass effect. At 9h30 of POD 4 (12 h and 30 min since symptoms started and 4 h and 45 min after the patient woke up with neurologic deficits), a T4 - T6 laminectomy and decompression was performed successfully. Intra-operatively, a prominent venous plexus posteriorly was observed at the site of epidural hematoma occupying the majority of the posterior epidural space. The patient completely recovered her neurological function and was discharged home on POD7.
Discussion In this case, despite following ASRA and ESRA neuraxial guidelines for anticoagulation, a normal coagulation profile and atraumatic thoracic epidural insertion, the patient developed an EH. The risk of neuraxial technique with subcutaneous UFH alone is well documented (Table 1). There are no documented case reports of EH when aspirin or COX-2 inhibitor were administered alone with neuraxial technique. However, there are cases of spontaneous EH associated with aspirin use. Even with the guideline recommendations, the risk of EH when combining a COX-2 inhibitor to other anticoagulant and antiplatelet agents remains unknown. A cautionary approach should be used for evaluating the need on of concomitant use of these agents in patients receiving subcutaneous UFH and aspirin. Patient’s prominent venous plexus might have contributed to develop the EH. The patient had complete neurological recovery after prompt laminectomy (within for 4h from the onset of neurological deficits). This reaffirms previous studies which show the importance to rapidly diagnose and decompress an epidural hematoma to avoid neurologic sequelae [3].

References:


CONTINUOUS SPINAL ANESTHESIA IN A PATIENT WITH AORTIC STENOSIS

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Purpose: General anesthesia is usually advocated in patients with moderate to severe aortic stenosis (AS) for its hemodynamically stable properties\(^1\), however the patient’s individual characteristics may require a different anesthetic management. In this case we successfully used a titratable continuous spinal anesthetic technique to manage a patient with chronic obstructive pulmonary disease (COPD), a potentially difficult airway, and moderate AS for a hip fracture repair.

Clinical features: Informed consent was obtained to release this information for publication. An 81 year-old male presented in the ER with a left-sided hip fracture for urgent surgical repair. His past medical history included moderate aortic stenosis with peak/mean gradient 55/32 mmHg and aortic valve area of 1.04 cm\(^2\), COPD and signs of potential difficult airway. After reviewing risks and benefits, we elected to proceed with a titratable continuous spinal anesthesia. The patient remained clinically stable during the 90 minutes of surgery with a stable systolic blood pressure and required only one dose of vasopressor (5 mg of ephedrine) about 15 minutes after spinal was initiated. Patient had a fast and uncomplicated recovery post operatively.

Conclusion: Although the safety of neuraxial anesthesia in patients with moderate to severe AS continues under investigation, the use of a titratable continuous spinal anesthetic technique allowed us to successfully manage a patient undergoing hip fracture repair with multiple complicating factors. Further research regarding the anesthetic technique in patients with AS is warranted to enhance our ability to provide safe anesthetic management that is tailored to the individual patient.

References:
